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A Record of the Progress of Pharmacy and the Allied Sciences



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THE AMERICAN
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# EDITORIAL

## EXPERT TESTIMONY

EVERY now and then a court proceeding that attracts much public interest and is well exploited in the newspapers presents the conflict of professional opinion that has been called "the war of the experts." Much unfavorable criticism is expressed concerning this class of testimony, direct corruption of one set or even of both sets of experts being suspected or even alleged. From a brief editorial notice in the current issue of the *Journal of the American Pharmaceutical Association,* (1925, *15,* 253) it is learned that the American Medical Association at its Dallas meeting will discuss the problem and endeavor to ameliorate the conditions.

Discussions of this nature are not new. The defects of expert testimony as developed under British and American law have often been presented in society meetings and in professional journals, and radical reforms have been suggested. Some nations of Continental Europe, operating to a considerable extent under the Roman jurisprudence, have a well-organized system of state experts, a system which is often praised, especially by those who know little about it. It is worth while noting that some of the distinguished Continental experts have expressed admiration for the British-American plan.

The fact is that the principle of our law is directly against any plan to deprive the parties in interest of the right to call such witnesses as will bring each side fully before the court or jury as the case may be. The Constitution of the United States (still the supreme law of the land, though sadly scoffed at by some) provides that an accused person shall have compulsory process for obtaining witnesses in his favor, and although there is a long line of decisions of the United States Supreme Court that the clauses of the Bill of Rights control federal courts only, most if not all the states of the Union have a clause of similar import in their constitutions. Under

such conditions no defendant could be restrained from calling experts to controvert the testimony of those called by the prosecution. Nor is it advisable to shut off opportunity for such controverting. "Great men make great mistakes," and one of the most important controls of science is the opportunity for free and trenchant criticism of all statements. A very distinguished surgeon of the middle period of the last century had entire contempt for digitalis in any form and advised his students against using it under any circumstances. One can imagine this man called as a state expert in a case and using his official position to enforce an opinion which a very large number of experienced physicians believed to be wrong. Consider for a moment the question of medical opinion on the use of whiskey in disease. The questionnaire on this topic distributed by the American Medical Association a few years ago received about thirty thousand replies, nearly equally divided for and against. Similar differences of opinion will be found on many other important questions in science pure and applied.

The view that the prosecution will always present an unbiased case to the jury is not sustained by facts. Some years ago a chemist of eminence reported the following instance. He had examined the viscera of a person supposed to have been poisoned by arsenic and had found both arsenic and zinc. It appeared that an embalming fluid containing these metals had been used, but the proportion of arsenic in the viscera was much higher in relation to the zinc than in the fluid, so that the chemist felt justified in assuming that arsenic had been in the body before the embalming. He wanted also to state in his evidence the finding of zinc, but the prosecuting attorney forbade this, knowing that such a statement would lead up to informing the defense of the fact of the embalming and thus rendering doubtful the chemist's inference as to the cause of death. Anyone who has had much experience as an expert witness on behalf of prosecuting officers will have encountered similar cases.

HENRY LEFFMANN.

# ORIGINAL ARTICLES

## THE SIGN OF THE SKULL AND CROSS-BONES*

By Ivor Griffith, Ph. M.

THE SIGN of the Skull and Cross-Bones is the sign of Death. And never was symbol more apt for it speaks the immutable, universal language. Out on the sun-parched sands of Sahara, where a whitened skeleton mutely marks the tragic end of a hopeless trail—or sailing the China seas, nailed to the sail pole of a pirate junk—or painted roughly on the threshold of a marked and hunted victim of the wild Camorra—or stamped in vivid red on the apothecary's label—everywhere it has the same significance—everywhere it is the same unpleasant symbol of the unwelcome but inevitable end.

Ivor Griffith, Ph. M.

Silently but certainly, it engenders fear in the heart of all who see it, and the jungle Javanese understands its meaning as thoroughly as the Gotham alley rat.

Yet despite the ghoulishness of the subject, and our fear of its symbolism, certain of its aspects are extremely interesting. Indeed, so entrancing a study is that of poison, that there is a vast literature available on the subject. Nor is this strange, for there is a subtlety and mystery about poisons, their smooth silent manner of destroying life, that exercises a compelling fascination.

In addition there is the fact that of all its instruments, there is none so commonly used by the Hooded Figure, as this weapon of poison. Death by poison, indeed, is not necessarily criminal or inspired, for whether the end comes by parasitic or germ disease, whether by organic failure, or hemorrhage or shock, or whether it be the natural death of senility—all are deaths by poison.

Moreover, poisons have played a most important part in framing history. Indeed, to them is largely due man's dominant position upon this planet, a fact to which we shall refer again.

Early historical records are replete with poison plots. Emperors

*One of a Series of Popular Science Lectures given at the Philadelphia College of Pharmacy and Science, 1925-1926 Season.

and kings have tumbled from their thrones, victims of the dread "black bottle"—and empires and kingdoms have, by the same token, frequently changed their destinies. In romance and in crime—for love and for hate—to quench and to quicken ambition—the poison vial has played its effective part. Nor is its career completely spent. For even today there is none to deny its inspired performances.

Despite the fact that the science of chemical analysis has made the detection of poisons a fairly simple procedure, and despite the fact that civilization has provided handier lethal instruments—the way of the poison vial is still known to the subtle criminal—and many the poor victim now vaulted in earth whose end came by appointment. The pink certificate, though writ with best intentions, does not always tell the truth.

Of course the world has got better—and as I go on with my story we may come to agreement on this point. For instance, there was a day in Rome long ago, when wives competed with each other, for the most convincing and yet mysterious way of sending a husband to Jupiter. They got rid of their husbands just as a matter of policy. Today we occasionally hear of a husband being dispensed with as a matter of insurance policy. Then it was prudence that made wives poison their husbands—now it is Prudential.

**ORIGIN OF THE WORD POISON**

But what is a Poison?

Let us just seek the origin of the word and then attempt a definition.

It is generally accepted that the word came to us from the Latin, by way of the French. Potio—a Latin verb meaning "to drink," gives us the words pot, potable, potion and poison. On its road it suffered some mutilation for the Middle English had it as puson, piuson and poyson. The odd mutation of a perfectly harmless word such as potion into the much more significant word "poison" is not readily accounted for—except that the latter word came to be specially dedicated to a "deadly drink." Anyway we have in the modern English the two words—potable and poisonous, which despite a common origin are entirely dissimilar in meaning.

In an old French version of the New Testament, the good Samaritan is singularly described as a *poissoner,* thus giving to the uninitiated a perverted sense of the happy parable. Elsewhere we find that the old French and Middle English word *Pois*—meaning "to weigh out in small portions"—is claimed as the origin of the word poison.

Yet another alludes to the French word for fish, namely, *pois-*

*son,* as a possible source. Still it is natural to conclude that this word also came from the first-named word *potio* (to drink) for it is a well-known fact, anyway, that fish spend much of their time drinking.

While on the subject of etymology there is much that is interesting about the origin of some other words associated with poison. *Tox,* which is the syllable whence comes such words as toxicology (the study of poisons), intoxication, toxemia, antitoxin, etc., is of Greek origin. The Greek neuter noun *"toxon"* means a *"bow"* and in the plural was used for the bow and arrow and even for arrows alone. Arrows tipped with poisons, such as snake venom, have been used in warfare since the dawn of history and the mutation of this Greek root as it came to us through the French, is thus readily accounted for. Indeed so recent an authority as the New English Dictionary defines the word Toxology—as the art of the bow and arrow.

It may be of further interest to note that the Hebrews use the same word to describe both the bow of warfare and the rainbow. To them that phenomenon was God's weapon forever hung high on clouds, a symbol and an earnest of His promise, never again to punish with flood and hurricane His sinning children.

"And it shall come to pass when I bring a cloud over the earth, that the bow shall be seen in the cloud and I will remember my covenant which is between me and you and every living creature of all flesh; and the waters shall no more become a flood to destroy all flesh."

**DEFINITIONS LEGAL AND OTHERWISE**

And now comes the definition. Scientists have never agreed on one definition. They rarely do on any definition. Every authority sports his own—and they are at great variance in some respects—and often incomplete. Here are a number of such definitions.

"Poisons are such inorganic or organic substances as are in part capable of artificial preparation, in part existing, ready formed, in the animal or vegetable kingdom, which, without being able to reproduce themselves, through the chemical nature of their molecules under certain conditions, change in the healthy organism the form and general relationship of the organic parts, and through annihilation of organs, or destruction of their functions, injure health, or, under certain conditions, destroy life" (Husemann).

According to Kobert—"Poisons are organic or inorganic unorganized substances originating in the organism itself, or introduced into the organism, either artificially prepared, or ready formed in nature, which through their chemical properties, under certain con-

ditions, so influence the organs of living beings, that the health of these beings is seriously influenced temporarily or permanently."

Blyth prefers the following: "A substance may be called a poison if it is capable of being taken into any living organism, and causes, by its own inherent chemical nature, impairment or destruction of function." Sollmann states that, "A poison is any substance which, acting directly through its inherent chemic properties, and by its ordinary action, is capable of destroying life, or of seriously endangering health, when it is applied to the body externally, or in moderate doses (to 50 gms.) internally."

For obvious reasons the Law also *defines* a poison—and the Pennsylvania State Law embodies as its interpretation of a poison "a substance deleterious to life in doses of 60 grains or less."

Yet with all of these high-sounding explanations, for definitions they are most indefinite. Almost anything is a poison if taken in large enough quantities, and on the other hand there is scarcely anything that cannot be safely ingested if the quantity be minute enough. An old English definition, said to have originated with "Bluidy" MacKenzie, hated by good Scots everywhere, is as follows: "The best of droggis given in great excess is poyson, for poyson consists in excess of quantity as well as of quality, and whatever overpowers our nature." So ordinary a compound as common salt may promptly poison the human being if enough be indulged in at one dose. The Chinese frequently commit suicide by eating a cupful of salt, and even the Bible tersely bids us to remember Lot's wife, who died, it is said, of some such salification. One may eat four eggs for breakfast, and still live but a teaspoonful of egg albumin, injected into the vein, will kill as certainly as strychnine. Even distilled water is fatal if much is so injected.

On the other hand, so active a substance as strychnine may not only be harmless, but actually a valuable medicine, if taken in sufficiently small doses. One grain of strychnine will kill the nine lives of one cat, but divided between ninety cats it becomes a mighty tonic —sleeks their fur, stimulates their purr and spreads their *meow* two octaves broader.

Then again, there is the element of time. Some poisons are cumulative, that is, they remain in the body, adding to their bulk, little by little, until the deposit finally becomes large enough to break the bank. Such a drug is arsenic. Certain vegetable drugs are said to act in a similar fashion.

Indeed, if we consider aright, there are many, many things which may be classed as cumulative or else time poisons, substances which we ordinarily never think of as such.

What is more blessed to that grand institution, the American husband, at break of morn, than the warm aroma of good coffee, wafting in through the open kitchen doorway? And to the monocled Englishman—what can compare with the delicious content of a teapot or two? Yet both of these beverages contain a poison—and one, which has a definite tendency to shorten our lives, providing it be frequently indulged in.

Consider tobacco. Do you remember the day of the primary sacrifice at Nicotine's altar? And what a sacrifice that was! Did you doubt then that tobacco had in it a poison—when you and your gastric contents were so suddenly parted? Of course, you have since then acquired a tolerance, but it is only superficial—for tobacco, whether it be in my lady's denatured cigarette, or in Papa's succulent pipe, has in it a violent, virulent poison, and its continued use is bound to be detrimental. Yet there is a consolation, which every Lazarus among us should know—and that is, that Dives smoking his dollar cigar gets a great deal more nicotine in his system than he who smokes the cheaper brands.

I submit that the destructive distillation which tobacco undergoes during the smoking operation greatly modifies its character, and that the products which reach the lung of the smoker are not just nicotine, but probably pyridine, furfural and like compounds. Yet, would it not be strange if every package of tobacco carried the sign of the skull and cross-bones?

And there is ethanol or grain alcohol.

In small doses, largely diluted with water, no one has ever accused this drug of being unduly poisonous. It has considerable vogue as a legitimate medicine. Even the most fastidious prohibitionist can be charged with consuming small quantities of alcohol, perhaps without knowing it—yet as certainly as one who wittingly drinks it. For every glass of buttermilk or soured milk—every over-ripened fruit—every pickled fruit or vegetable—every bottle of home-made root beer, contains a trace of alcohol. Nor would we call these poisons on that account.

But on the other hand, who lingers to long with Bacchus—who dallies too much with the juice of the vineyard or with essence of still—will eventually find his Nemesis. For alcohol † in quantity and

†See article by Dr. Kilmer (page 288, this issue, this Journal).

frequently indulged in, is a poison. Listen to a textbook description of its physiological properties:

"Alcohol is a cerebral depressant and a narcotic poison. Long-continued use, even in moderate doses congests the stomach and liver, over-irritates the gastric glands—and depresses the heart and the arterial tension."

"In large doses it destroys pepsin, produces intoxication, hallucinations, delirium, muscular inco-ordination and sometimes death by paralysis of the heart and respiration."

Over and above two ounces cannot be oxidized in a day—any amount beyond that is a poison in the system, setting up structural changes in the organs and lowering the resistance of the body. The very fact that wine cannot be made by simple fermentation, having a concentration greatly beyond 15 per cent, is ample proof of the poisonous nature of alcohol. For at a strength of 15 per cent alcohol will kill the yeast cells—the very organisms which work to produce it.

Alcohol is a preservative because it is a poison—for no self-respecting germ can hope to live in its presence.

But we shall have yet more to say of alcohol.

Still another debatable point has to do with the question of absorption. For a substance may kill if taken into the constitution without itself being inherently poisonous. A box of tacks never carries a poison label, yet who would think of adding to his hemoglobin by swallowing a boxful? Death would inevitably follow. The same is true of powdered glass—and similar traumatic instruments of death.

Indeed, no matter how we consider the definition—we are forced to the conclusion that there is so much relativity or degree, and so many diversified aspects to it, that we might just as well go on with our story, with whatever understanding we may have. Passing on, then, we will ignore the systematic classification of poisons and conditions modifying the effects of poison and other phases of toxicology.*

And from this point on, so that a semblance of order and continuity may be said to appear in our story, I take liberty to divide

*We even pass by the interesting question of the manner of acting of poisons, for in the subject alone is material enough for half a dozen lectures. Besides, it is controversial ground, and only safe, therefore, to those who go well armed.

Thus do we gently, but very wisely, pass on to safer territory.

the balance of my presentation into two parts, which will be as follows:

The Poisons and Poisoned of History.
The Poisons in Food and in Medicines.

## The Poisons and Poisoned of History

The use of poisons was undoubtedly known to primitive man early in his existence. One is so accustomed to think of the cave man only as a wielder of clumsy clubs and crude stone instruments. Yet he must have possessed considerable knowledge of poisons, for what fragments of records we have, indicate, in some respects, his understanding of the fatal art.

**FROM OVER THE HILLS OF CHAOS**

There is no more fascinating phase of human existence than this daybreak of intelligence—when the being called man emerged from the space-covering animal into the time-binding pattern of God. One only speculates as to how long this procedure occupied. Certainly many long millenia. Yet, finally, over the hills of chaos the thinking creature dawned, and it was not without purpose that man, this creature, soon found himself the privileged tenant of the universe. And he knew it!

To his primitive mind it was a foregone conclusion that the earth and all upon and below its surface belonged to him and him only. It had been fashioned especially for him, to furnish his food, his fun and his physical comfort. Everything on earth was for the service of man and nothing existed that was not so disposed.

Yet in establishing his dominion he came upon countless difficulties. Enemies, huge and powerful, beset him everywhere. The cunning creatures of the wilderness—his own wandering cousins—slimy, creeping things of the bogs and marshes—even the berries on the trees conspired against him. But he set his brains to save his face, and soon he had the answer. Said he, "I will turn mine enemies against each other."

With his clumsy spear of flint he smote the coiling snake or creeping lizard, whose wicked bite his fathers knew. Out of their fangs he drew the poison venom, and smearing his arrow tip with this he laid low his tribal enemy and even caused the towering mammoth to totter in its tracks. He knew also the selective deadliness of the red berries of the bush and of the green things that grew in profusion about him. Sudden and horrible deaths seemed to spring from nowhere with the mere eating of them. Devils, he blamed at first, but when the same red berry or the same green leaf repeated its ter-

rible killings, he soon learned to fix their identity and fear their subtle powers.

But man has ever been acquisitive, and it was not long before he put to use the poison of leaf and berry. Who first learnt these secrets undoubtedly kept them inviolate, and so wielded, for the time, immense power over his comrades—just as in late days the medicine man and priest of the North American Indians dominated his tribe because of his knowledge of plants and poisons.

But in their warfare against other tribes, against mammoth and mastodon, every comrade carried arms. The prepared juice of the poison plant, and the venom of snake and toad, smeared over arrow and spear, soon made these two-legged beings masters of plain and mountain. Today in the remains of their rude abodes, in cave or temple, the archeologist and his band find mute evidences of this valiant fight for worldly dominance. Arrowheads and spearheads worked with depressions, presumably for holding the poisons have been found in cave remains of the paleolithic period in Europe.

So we see how important a part the poisoned dart and the envenomed spear have played even in the earliest stages of the ascent of man. Very recently a famous evolutionist expressed the opinion that man rose above the beast when he first learned to utter speech. One has to be neither an evolutionist nor famous, to appreciate that the bandy-legged dinosaur would have succumbed much sooner to a dozen poisoned arrows than to a scolding in any language.

And on through history the poisoned weapon has ever been an instrument of destruction. Not even the Bible can refrain from mention of them, for Job, the Scriptural paragon of patience states, in his special bureau of complaints, that

> "The Arrows of the Almighty are within me,
> The poison whereof my spirit drinketh up."

And even today in darkest Africa, venturesome explorers fear the poison dart of the pigmy savages infinitely more than the lion's claw.

The literature of Greece and Rome is replete with references to this polite and effective practice. Homer mentions them in the "Odyssey" and Alexander was not above using them in the conquest of his world. Hippocrates, the Greek family doctor, devotes much space in his "Practice of Medicine" to sundry ways of combating their evil effects. Ovid, in his metamorphic songs tells of insulted Apollo, who slung his poisoned arrows inflicting men with plagues and pestilences.

Cupid, to this day is pictured with his bow and quiver full of arrows —and those of us who have happily felt the sting of his well-directed dart, can attest to the fact that he had a potent poison on his weapon, withal not fatal, but mighty strenuous on the heart—and lasting sometimes for a lifetime. There are some, today, however, who have it that Cupid has changed his brand—or else that humanity has acquired a partial immunity to his cunning.

Celts and Gauls, according to Pliny, also practiced this poison mode of warfare, the former using vegetable poisons made deadlier by mixing with putrefied blood and poisonous toadstools. And from that early day to this the poisoned arrow and spear have been the instruments of warfare of numberless tribes and nations all over the world.

In Africa, where the surge of civilization yet beats against the impregnable jungle, the wily native still uses this primitive and ghastly mode of dealing death. And strangely enough he finds another use for poison. He uses it as a means of enforcing the law. Commonly this practice is termed "ordeal by poisoning." The suspect is politely requested to drink, on an empty stomach, a bowl of liquid, which may be an infusion of the deadly sassy bark (*erythrophleum guineense*) or the calabar bean, or some variety of strychnos, or curare, or other deadly drug.

He is then led to the village combination swimming hole and drinking trough where he is permitted to drink as much water as his tissues will hold. Of course, witnesses are present to see that no antidote is indulged in. Now, the naive African theory is that if the suspect is innocent he will survive the ordeal—if guilty, he will not. And there are several advantages to such a method of trial. In the first place there are no lawyer fees for the estate to worry over, and in the second place it affords an effective checkmate to the unusual high birth rate among these jungle tribes. Then again, it does away with jails and murderers. It is a method which might be safely commended to our present-day jurists. Certainly it has in it none of the maudlin sentiment wherewith the crimes of arch fiends and criminals are too frequently condoned by this uplifting day and generation.

Unfortunately, however, as in all courts of justice, the innocent often suffer and the guilty escape. For it is said that those having the wisdom to drink their fill of water so excite the stomach that it will disgorge its contents in a perpendicular direction and so rid the system of the poison. You see, those who learn the trick properly,

cannot ever be guilty. Thus, cultivating an enormous gullet in Africa is comparable to cultivating an enormous wallet in America.

Indeed, the role of the poison has always been most diversified. In many countries it has replaced the hangman's noose. Socrates, the famous Greek philosopher, paid the state penalty for having too much brain by drinking of the fatal hemlock cup.

How realistic is Pliny's graphic description of that great man's end.

"When the fatal cup was brought he asked what it was necessary for him to do. 'Nothing more,' replied the servant of the judges, 'than as soon as you have drunk of the draught, to walk until you find your legs become weary and afterwards lie down upon your bed.'

"He took the cup without any emotion or change in his countenance and, looking at him in a steady and assured manner,

" 'Well!' said he, 'what say you of this drink?'

" 'May a libation be made out of it?'

"Upon being told that there was only enough for one dose, 'At least,' he said, 'we may pray to the gods as is our duty and implore them to make our exit from this world and our last stage happy, which is what I most ardently beg of them.'

" 'Having spoken these words he remained silent for some time and then drank off the whole draught.'

"After reproving his friends for indulging in loud lamentations, he continued to walk about as he had been directed until he found his legs grow weary. Then he lay down upon his back, and the person who had administered the poison went up to him and examined for a little time his feet and legs, and then squeezing his foot strongly, asked whether he felt him. Socrates replied that he did not. He then did the same to his legs, and proceeding upwards in this way, showed us that he was cold and stiff, and he afterwards approached him and said to us that when the effect of the poison reached the heart Socrates would depart. And now the lower parts of his body were cold, when he uncovered himself and said, which were his last words, 'Crito, we owe Aesculapius a cock. Pay the debt and do not forget it.'

" 'It shall be done,' replied Crito. 'But consider whether you have anything else to say.'

" 'Socrates answered in the negative,' but was in a short time convulsed. The man then uncovered him; his eyes were fixed and when Crito observed this he closed his eyelids and his mouth."

In Kentucky, hydrocyanic acid now replaces the electric chair—and is probably much more efficient and certainly less costly.

Again for suicidal purposes—the poison bottle is always "Johnny on the spot." And the contention of some who argue that everyone who commits suicide must be at least temporarily insane—finds much encouragement in the ridiculous judgment that the victim so often

shows in the matter of choosing the poison. Who but a senseless idiot would ever select carbolic acid as a means to an end? To bear me out in this assertion, I submit a label taken from a bottle of Calvert's carbolic acid, popularly used for poison purposes a generation or so ago.

But there may have been a real reason for the prevalence of the carbolic acid poisonings referred to, and for many other similar self-poisoning epidemics. For there is a fashion—a sense of style—that beckons its followers here—as in every human practice. Let a prom-

**POISON!**

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inent man commit suicide today by eating paris green—let the newspapers headline this fact and explain with exquisite detail the gruesome workings of the poison—and tomorrow a score of other idiots fade from the picture, victims of a brand-new fashion.

In seeking through the literature for material wherewith to build this lecture I have been amazed at the variety of poisons, at the expertness of the poisoners, and at the wealth of pharmacologic information which came into the possession of the crude peoples of long ago. Yet it is not without reason—for despite their limited facilities for observation—their need for lethal weapons and their continuous

search for such weapons, mothered in a most natural way their numerous inventions. Practice makes perfect—perfection is science—therefore practice is science and science is practice.

**THE SCIENCE OF POISONING**

For instance, how did the Choco Indians ever find out that if a certain variety of tree lizard was toasted or roasted in front of a fire it would cause to be exuded from certain glands a terribly fatal poison? How did the jungle pigmies of the Congo come upon the discovery that the entrails of a perfectly innocent-looking upholstered worm contained something which quickly extinguished animal life, something which, smeared on arrow or spearhead would send that weapon hissing through the jungle air a certain emissary of death!

Livingstone, the great explorer, tells of one of his native carriers who succumbed to a mere scratch caused by such a poisoned weapon. "Excruciating agony, violent tremors, and almost instant death"—yet states the explorer, "the jungle warriors have a prompt way of antidoting its effects should they by accident sustain injury from their own weapons." For this purpose they use another part of the same caterpillar. "Like cures like" has been the practice of the jungle for time immemorial—yet Hahnemann is given the credit for coining that phrase.

The Ovambos of South West Africa prepare a concoction from the seed of the strophanthus and a secretion obtained from red ants, so deadly, it is reported, that a single arrow has been known to kill an elephant. Yet, when game is killed with this same poison, the natives merely add to the wound the juice of the boabab tree, which kills the venom, and makes the meat edible.

Malay cunning is proverbial, and their knowledge of poisons is encyclopedic. It is claimed that their medicine men are able to cause loss of voice for eight to ten days through the oral administration of certain vegetable poisons. Such a medicine might be put to very effective use even in civilized lands. But that is another story.

These people have developed the science of poisoning to such an extent that they can with accuracy time the death of their victims, so that it will occur exactly a month, three months or a year from the time of administering the poison. Also, it is told of them that they know of certain fruits and common vegetables which greatly help certain poisons in their effectiveness.

Natives of the New Hebrides smear their arrows with damp earth containing the lock-jaw bacillus, and a gummy exudate to make the poison stick, a combination which generally fatally infects the

recipient of the arrow. For this poison they use a very sharp, elongated arrow tip, for they, long before Pasteur, knew, in their crude way, that the bacillus of tetanus was an anærobic germ.

Thus is anticipated some of the ungodly practices indulged in by the reckless nations of Central Europe during the great World War. Indeed Germany, when she let loose that first cloud of yellow poison gas, on that never-to-be-forgotten day, practiced a crueler, more insidious and despicable mode of warfare than was ever practiced by the most primitive and fiendish tribes of Africa. But that also is beside my story.

Listen to the ingeniousness of this. Certain tribes make their arrowheads of a crystalline sandstone so sharpened that their cutting and flesh penetrating qualities are very effective, yet so brittle that if they miss their victim they shatter into a thousand fragments and thus cannot be reaimed at their original owners.

In India, with its remote history, the poison has always played a most prominent role. One reads of food tasting slaves whose duties preceded the regal lunches—testing every dish and every drink intended for their king. Every once in a while, before the feast, a slave would turn up his toes on the marble floor, whispering with his dying breath—

"Now, wasn't that a dainty dish to set before a king?"

With the subtlety and cunning of the Orient, sundry and devious were the death-dealing devices of India. Incense saturated with volatile venom, whose fumes carried the message of death to every room in the palace. Opium soaked in deadly arsenic, so that its smoker should never smoke again; rings of gold with poison fangs, whose wearers would never live to take them off; queer candies loaded with the tasteless principles of the wild datura; such were the wily ways of India.

It is said that arsenic, which produces symptoms much like that of Indian cholera, came to be quite the convenient poison fashion in that land at one time. Wives who grew tired of their husbands as quickly as our wives grow tired of their Easter hats, found it a most convenient way to get rid of the undesirables. And the poor husbands died without protest, until the custom grew so rapidly that the survivors finally got together and formed the first S. P. C. A.

After a great deal of bribing and lobbying they finally persuaded their legislature to pass a law that every wife must expire on her husband's funeral pyre, a custom which in parts of India persists to this

day. Husband poisoning quickly ceased—indeed it so affected things that husbands from then on lived to a ripe old age and insurance companies doubled their dividends.

France and Italy, nations having much in common in the way of culture and refinement—made poisoning a really fine art. In France the most expert poisoner of all time was the Marquise de Brinvilliers, whose fancies were so ephemeral that she had to devise some effective way of disposing of yesterday's sweetheart to make room for tomorrow's. When a young girl she took a course in poisoning in an Italian correspondence school, headed by an Italian poisoner of great renown. When she, the gentle lady, graduated with honors from that institution, her next training was purely clinical. Under the pretense of charity she visited the hospitals of her city, and tried her poisons on the patients there. If they lived through the experiment they were lucky, if they died the Marquise was the lucky party. Thus she learnt a great deal about poisons. Quite in conformity with modern medical education—now that she had gone to school, graduated—served her interneship in the hospital—she was a full-fledged practitioner. And she had much success. First she poisoned her father and two brothers; then some dear friends—her mother-in-law—but never her husband. Several times, it is said, she would give him a deadly potion, but always, overcome with remorse, she would rush in and save his life with the proper antidote—probably just for the joy of making up again. Finally, however, in spite of royal patronage, the lady was herself tortured to death by what remained of the population of France.

After her death in 1682, poisoning became so common that Louis XIV passed a law† forbidding apothecaries to sell poisons except to persons known to them, and even these had to sign a book, provided for the purpose. This was the first "Poison Register" established—and in every drug store, in every civilized country, it is a requirement that is still imposed by law, and which has been a most effective instrument in curbing and in detecting the criminal use of poisons.

It was the criminal use of arsenic and mercury that led to the introduction of poison laws in England, where, in 1511, a law was passed making murder by poison high treason, the exquisite penalty for breaking it being death by boiling in an iron cauldron.

†To Scotland belongs the honor of introducing the first law of poisons. It was passed in 1450 in the reign of James II, whose Court apothecary had a booth in the bellhouse in Edinburgh, and enacted that "all persons are forbidden under pain of treason to bring home poison for any use by which any Christian man or woman can take harm."

Here is a list of poisons used in England for sundry and divers purposes as early as the seventh century:

> "Of deleterious substances, the following animals are destructive: cantharis, buprestis, salamander, pine-caterpillar, the sea-hare, the toad, the mute marsh frog, and leeches when swallowed; and of seeds, henbane, coriander, fleawort, hemlock and gith; and of juices, meconium, opocarpasum, thapsia, elaterium, ixia, hellebore, black agaric, ephemeron (which some call colchicum because it grows in Colchis); of trees and pot-herbs, smilax (which some call thymium, but the Romans called taxus), the strychnos furiosa (which is called dorycnium), the Sardoan herb (which is a species of ranunculus), horned poppy, pharicum, toxicum, wild rue and mushrooms; of animal productions, fresh bull's blood, coagulated milk; Heraclean honey; of metals, gypsum, ceruse, lime, arsenic, sandarach, litharge, adarce, lead and that which is called mercury; and of other articles, much wine taken at a draught after a bath, or cold water in like manner."

It was in Italy, however, that inspired poisoning held longest sway. From the balmy days of Rome through to the Middle Ages, Latin history abounds with sinister stories. By the government itself the effective poison was used as the weapon of diplomacy. Statesmen vied with each other in the toxic arts, and the better the poisoner the better the statesman. In the Church, also, priests climbed over the dead bodies of their victims into the papal eminences.

**THE HALCYON DAYS OF POISONING**

Indeed it was in Italy, in the land of romance, that poisoning had its halycon days. The poison fad lasted there long after its passing elsewhere, for it suited the remorseless refinement of the Latin much better than the blunt and cruder lethal weapons of other lands. The halberd and sword, the axe and lance, were tools of death in any butcher's hands, but the silent, slow and sure poison could only be handled by experts.

Emperors of Rome hired champion poisoners to provide work for undertakers; wives vied with each other for records in the ladylike art of poisoning husbands and wealthy relatives who seemed too healthy. Indeed, we are told of one Locusta, who was made the official court poisoner by Nero—who so pleased that Emperor by her clean-cut way of poisoning his step-son that he immediately gave her a hundred healthy slaves wherewith to try to improve her art.

"Toffana water"—possibly the most atrocious poison of all time, was the invention of an Italian woman. It was an arsenic distillate sold in little vials and presumably intended as a beautifier when taken

in small doses. Secretly, however, instructions were given as to how it could be expeditiously used to remove even the strongest to kingdom come. Upon its label it bore the picture of a Saint—and when properly administered it never failed in its sanctifying business.

Six hundred victims are attributed to its use. After the Countess Toffana came Hieronyma Spara, who organized a secret society of Roman ladies of high caste, composed chiefly of young and faithless wives.

Later still came the church-going Borgias, whose family name has become synonymous with fatal poisoning. They brought the art of poisoning to its pinnacle of perfection. Any one invited to dine with Cesare Borgia always made arrangements with the grave-diggers before going. Somehow, upon one occasion, because of a hitch in the program, several guests escaped the poison dinner, but the host gallantly invited them to stay for supper. They did. The Borgias seemed to know much about the ptomaines, for their keenest and most fatal poison according to one of their recipes was thus prepared:

> "Cut a young pig in two. Powder the carcass with arsenic. Let it putrefy for twenty days, meantime collecting the liquids that drip from the rotten mass."

Enough! But let us not forget that much of the progress in science, especially in medicine and chemistry, then called alchemy, dates back to the Renaissance period, and to the researches of these wicked but studious poisoners.

### Poisons in Foods and Medicines

From the instant that ovum and spermatozoon unite to herald our being, to the dark day when

> We fold our tents like the Arab
> And as silently steal away

our ways are beset with poison menaces. Life is a continuous conflict with death—and in the individual, death is the inevitable victor. There is a master poisoner in the shadows, ever scheming with his endless toxic ways earth's children to destroy. His is the joy of analysis. Never satisfied with our pattern, he destroys us—disorganizes—and returns to dust again our precious constitutions, there to remain till Life the syntheist again comes wandering by and binds our poor dust once more in its electric fluid.

So do the cycles come and go. So is matter bartered in the scheme of things. And as previously stated, it is Poison that plays

the pivotal part in Death's destruction as well as in Life's construction work. For no matter how we die—whether by germ disease or shock or old age—it is poison that always kills us—and all through life we are constantly dealing in poisons—the coffee—the tea—the cigar—the cocktail—our medicines—our automobile-infected air—all of these things are poisons to some degree or another.

But I should like to have time to talk of poisons in many other ways. There is ricin, a poison so potent that a grain will kill a circus of elephants—yet it is obtained from the castor bean, which furnishes castor oil—a poison only to little children. There are the cyanides, built up from the harmless carbon and the inert nitrogen. Yet these simple elements—once they are suitably linked, form a poison

"more deadly than a mad dog's tooth."

**THE ROMANTIC ANTIDOTES**

And then we have ignored the antidotes—or those substances which antagonize poisons. History is full of foolish fancies in regard to these. The unicorn's horn—the universal antidote of Mithridates VI, said to be the origin of the fad of polypharmacy; Elisha's antidote at Gilgal—when he caused a powder to be added to the soup of poison herbs fed to the sons of the prophet. Said they, "There is death in the Pot"—and Elisha, the first colloid chemist—threw in the powder that probably adsorbed the vicious alkaloids. Then we have that other evidence of Thomas' doubtful mind when we are told of a gate which he built of horns of the rhinoceros for Gundoforus the Great, a device which was supposed to keep all poisons out.

Did you know that an opal turns pale beside a poison and that peacocks ruffle their feathers and screech like mad when a poison is close by?

Or I should like to have the time to talk of such things as the poison by-products of growth, or the poison sewage of the body—of the poison manifestations of fatigue and of disease, of ptomaines and toxins, alkaloids and organic poisons, of the poisons of old age, of the poison end gases deposited in the muscles through exercise, of the poisons used in industry, and as insecticides and the like.

But these are stories much too involved to be told here.

And so for the brief time remaining at our disposal I prefer to refer, in a very unsystematic way, to some facts regarding poison in foods and medicines.

Prior to the passage of the Pure Food and Drugs Act and other similar legislation elsewhere, life hereabouts must have been ex-

tremely hazardous. For, in addition to what might be termed the inspired poisons, there were many toxic substances introduced into foods and medicines either through downright criminal deceit or else through ignorance.

**POISONS IN FOOD PRODUCTS**

Poisonous preservatives and correctives of all kinds were used in edible products. Borax and formaldehyde were found in milk, alum in flour, salts of copper in canned peas and beans, fish berries and carbonate of lead in beer, red lead oxide or venetian red in sauces and catsups, vermilion, a mercury compound, in cheese, sugar of lead in doctored wines, chrome yellow in cakes, gamboge in candy, lead salts in drinking water. Nothing seemed to escape the cooking pot and Frederick Accum, of England, writing two centuries ago, introduces his book on Food Adulteration thus: "This book is to impress the mind of the Publick with the magnitude of an evil which prevails to such an extent that we may exclaim with the sons of the Prophet:

"There is death in the pot."

Let me draw you a picture, let us say in 1870 or 1880, of just one hazardous day in a Philadelphia dietary. Before using the paint brush too generously, I caution my listeners to be discreet about coming to conclusions too abruptly, for the picture which I draw is cubist —that is, you have to squint at it or you may have to stand on your head in order to appreciate it properly.

**THE HAZARDS IN OLD PHILADELPHIA**

"Out of bed at five-thirty—and up here in Northern Liberties we still have use for oil lamps. So I light one that stands on the table of my bedside. Now, this may blow up anytime, for they tell me that the Oil Companies have to find some way of getting rid of the gasoline, so they simply mix it with the kerosene. It will mean a fortune to the person who discovers some good use for this dangerous gasoline.

"I wash up in the china bowl—and despite the fact that I have had my window down all night to keep the cold out—yet the water in the basin is covered with thin ice. But a little brisk lathering and brisker scrubbing sets my blood cells caroming through my constitution—and I feel fit as a fiddle—only some of the free alkali from this home-made soap gets in my eye and burns like the very dickens. Some day some bright aleck will invent a floating soap, 99.9 per cent. pure—then it won't be so difficult to find it under the bubbles. I needn't shave today—I have three days to go before the week's up. Oh, yes! tooth scrubbing—I must not forget that—still, I have to let

it go, for I cannot find the sandstone. I guess Ma has taken it downstairs again to scrub the front door-steps. Well, I'm all set except my collar, and I'll have to wash that a bit. Now, let's see—I have to be careful to keep that away from the lamp—Sam Smith burned to death the other day when he lit a match on his celluloid shirt front.

"Now for breakfast. Oatmeal and cream—the oatmeal tastes wormy, it probably is, and the cream is full of starch and fuller's earth. Still I eat, for *I know of no law to stop these things.* On comes the bacon and eggs—the bacon is all right, providing it survives the frying pan, because it has so much saltpeter in it, once a spark gets on it will burn to the bitter end—*and there's no law to stop it.* If the eggs were wine they'd be mellow and fit for a king—but eggs, unlike wine, do not improve with age. Anyway, Ma said the third one she opened was tolerably odorless. With breakfast there is at least one consolation, and that is, you cannot tell alum in toast bread. Ordinarily our bread tastes like a styptic pencil, but when toasted it is every bit as fine as motzas. Only the butter tastes queerly—some people call it pig butter, it has so much lard in it. Even the sea salt has sand in it—*and there's no law to stop it.*

"Well, this cold weather, I always take my tonic after breakast—essence of cod liver oil. They do say this cod liver oil is fine, and believe me, when I take a wineglass after breakfast I'm a new man. I feel tip-top, or shall I say tipsy-topsy. I never knew cod liver oil to be so tasty and to have so much authority. Pa says it has alcohol in it—I don't believe it—it doesn't say so on the label. If it did, I'd have to quit using it, because I'm the cheer-leader in the Epworth League. Besides our minister takes Peruna—and *there is no law to stop it.*

"Now it's lunchtime—sausage and hot cakes. Fine! only there is no assurance that the meat is what it should be—a pig in a poke—anyway when fried it is rather hard to tell between pulverized pig and granulated goat. But so many people have died of poisoning through eating bad sausage recently, that one must be very particular about the last syllable in the word. Still, there is an advantage in dying from poison in sausage. Doctors say the body takes much longer to decompose.

"Doctors call such poisons ptomaines, and if I remember my Greek properly, the word very appropriately came from *Ptoma,* meaning a corpse. Lunchtime I usually drink plenty of water—today I had no need to. The milk and the maple syrup were watered enough. And *there is no law to stop it.*

"So to supper at six. Meantime I ate some candy, licorice lozenges, finished in two-tone lacquer. At least that is what a chemist told me about them. He said they were really poisonous—and that they were made of lampblack and glue with some sugar all melted together, molded into queer shapes and dipped in anise-flavored shellac varnish to make them keep. Well, I'm still alive—although something did give me a passing indigestion!

"For supper we have a regular old-fashioned Philadelphia meal. Oysters to start—worried a little over that—for someone said typhoid comes from oysters brought up in beds that are not well aired. Then we had city-dressed beef (any city will do) and cabbage, potatoes, and green peas. Of course, one runs a risk these days with potatoes boiled in the jacket, there may be arsenic or paris green on them—and slug-shot in the cabbage. But the peas—Ireland was never so verdant! Every pea that rolled off Papa's steel knife left a trail of copper in its wake. Some things turn green with envy, peas turn green with copper sulphate. *Well, there's no law to stop it.*

"Then, lastly, comes tea and baker's cake. The tea is fine, one needs to be very analytical to tell tea from dishwater, but the cake has yellow jaundice. Papa told the cook never to buy any more cake from that baker, because he buys his eggs from a drug store. Nevertheless, I eat a lot of it, and thought it was fine, but how sick I got the next day.

"First thing the doctor asked me was how long I had been a painter—and he wanted to diagnose my condition as painter's colic!

"No wonder—I learned afterward that the bakers use chrome yellow (lead chromate) to color their angel cakes. It is much cheaper than eggs and much more colorful. Besides, it is a poison so appropriately used in angel cake—so mathematically correct—one cake equals one angel, etc. *And there's no law to stop it.*"

So we come to the end of a more or less perfect day in the dietary of an old Philadelphian, and that our hero survived is only testimony to his Quaker sturdiness.

Still, I remind you, that even though the law protects our foods and medicines today, we exist yet in a world of hazards. The skull and cross-bones only takes another form. Today the wizard of death runs on four wheels or flies in the air astride a bullet.

Yet in many ways the world is getting better, and such conditions as described above are no longer incidents, they are accidents, Occasionally, of course, poison comes to the table, but the chemists,

and others enforcing the Pure Food and Drugs Act, are very alive to the situation. Today, his majesty, the American citizen, proudly dominates the dining-table and somewhere in the background, like the slave food tasters of old, are these watchers of the laws making the food safe for democracy.

**POISONS IN MEDICINES**

And his medicines, too. Time was when soothing syrup, and cough "cure" contained enough morphine and cocaine to start out any number of addicts to their fatuous, useless ends. Babies were swindled to sleep with morphine lullabies. Tonics were prepared with wood alcohol whereupon people went blind, and doctors thought a new eye disease had come. Then, anyone could buy laudanum, like treacle, by the quart, and opium by the pound, like Cheshire cheese.

Today, happily, the indiscriminate sale of such poisons as cocaine and morphine, etc., is almost totally stopped. Yet, though their legal use is limited to the doctor's prescription, curiously enough faddists tell us that such addiction is on the increase.

I would not consider this lecture complete did I not say something additional about the Poison Rum problem. Yet, it is difficult to do aught but express an opinion. Chemists, toxicologists, physiologists, physicians and biologists all offer conflicting opinions upon this peculiar problem, and often there is no worth to their judgment. Some state that the only poison in our alley liquors is in their alcoholic content. Others refer to the denaturants, wood alcohol, diethylphthalate, mercuric salts, alkaloids and similar compounds which find their illegal way into bootleg liquors. Another group blames the toxicity of these illicit spirits upon the unblended esters and aldehydes so abundant in the freshly-distilled liquor. Others, again, claim that copper is the toxic culprit; think of it, liquor potent enough to dissolve a copper still, yet stomachs of flimsy flesh are asked to put it in storage.

Two government chemists recently went on record as incriminating acetaldehyde, frequently found in distilled liquors, as responsible for all of the sins of hooch. Later a Western pharmacologist showed the apparent harmlessness of that compound when given in reasonable doses.

The truth of the matter probably is that all of these factors contribute to the killing qualities of the factitious liquors of this Prohibition day. Yet, the most toxic *impurity* in distilled liquors, always has been and ever will be—its content of *alcohol*.

The bootlegger of America is pictured as a composite reincarnation of Locusta—the killer of emperors—of Toffana, the death bane of husbands, and Cesare Borgia—destroyer of his countrymen.

He may be all of that—yet he is no more so than the liquor compounders of every day and generation—for ever since No-ah said "Yes-sah" to the first bootlegger, alcohol has always been itself a poison, and poison it will ever be.

Nor is this creature called the bootlegger indigenous only to America, for I find in the *Tatler,* Vol. VIII, page 110, edition of 1797, the following paragraph:

> "There is, in this City, a certain fraternity of chemical operators, who work underground, in holes, caverns and dark retirements, to conceal their mysteries from the eyes and observations of mankind. These subterranean philosophers are daily employed in the transmutation of liquors and of the power of magical drugs and incantations, are raising under the streets of London the choicest products of the hills and vales of France.
>
> "They can squeeze Bordeaux out of a sloe and can draw Champagne from an apple. Virgil, in that remarkable prophecy,—
>
> *" 'Incultisque ruhens pendebit sentibus uva.,'*
>
> " 'The ripening grape shall hang on every thorn' . . . seems to have hinted at this art, which can turn a plantation of northern thorn hedges into a vineyard. These adepts are known among one another by the name of *Near-brewers,* and I am afraid, do great injury, not only to their Majesty's customs, but to the bodies of many of her good subjects."

And so I bring this lecture to a close. There is much concerning poisons absent from our discussion. Yet I hope you may have sensed the romance weaving through the story and that you may have appreciated the important part which poisons have played in making the world, man's inheritance. I hope you are satisfied that the world is a much safer, pleasanter place in which to live, than ever it was before.

But, in conclusion, I must again submit my apology for the lack of specificity—and the general indirectness and vagueness of the lecture. And I know of no better way to formulate my apology than by this quotation from the court records of Liverpool, in England:

Dr. Christison, eminent toxicologist and professor of medical jurisprudence at the University of Edinburgh, was giving his expert

evidence as to the recognition of a certain poison sought for after death, in a criminal case said to the Judge: "Your Honor, there is but one deadly agent of this kind which no chemist can ever detect in the human body after death, and the name of that poison is" . . . when he was sharply interrupted by the Judge. "Stop, stop, Dr. Christison. It is much better the public should never know it."

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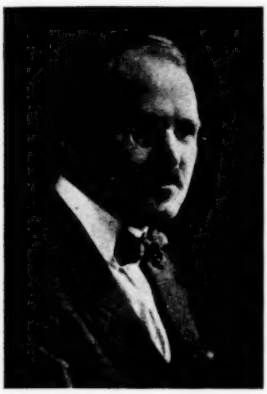
## DELECTABLE CONFECTIONS*

**By E. Fullerton Cook, Ph. M.**

"HERE'S a gift for you, dear!" "Oh, daddy! What is it?" "I know—a box of candy!" "My, but you're good—you know I love them!" "What kind are they?" "Oh! One of those 'mixied' kinds, every good thing there is, in one wonderful box!" "Thanks, lots!"



E. Fullerton Cook, Ph. M.

"Yes, indeed, my dear, in that box is more than candy, more than sweetness and beauty!" "I found, as I came along, and allowed my imagination to run, that it was a veritable box of mystery; it carries travel, romance, history, brave adventure, empire building, the foundation of great fortunes, and a library of stories all within itself."

"Sit here in front of the fire, daddy, and let's make it our magic wand to reveal all its secrets."

"Have you ever seen these *new coverings?* They are as clear as crystal and are dust and water-proof. Did you know that some clever chemist discovered how to make silk, starting with nothing more valuable than cotton or even wood-pulp? He passed it through a mysterious proccess and turned out a product which rivalled the natural silk, known through the centuries. This covering is only another form of artificial silk and it helps to keep these good things clean, sweet and fresh.

"I am sure, too, that this *beautiful box* represents the tangible dream of some real artist and would lack much of its beauty if it had not been protected as it passed through many hands this Christmas time.

*One of a Series of Popular Science Lectures given at the Philadelphia College of Pharmacy and Science, 1925-26 Season.

"But what is inside? It is about time to wave that magic wand again and find ourselves borne to some place in the mystical tropics, where sweets seem to fairly ooze from the rich, fragrant earth. It's a *bon-bon,* but that only means a delicious bit of confection, literally, 'good good,' or 'very good.' Ninety per cent. or more of it is sugar, which was first spoken of by classical writers as 'India's honey-bearing reed.' In the first century this sweet-grass was recognized as a delicacy but after that for almost a thousand years no one separated the essence of sweetness into the form now known as sugar. Great trade caravans passing through the Mediterranean ports and across the mountains and deserts to the far East, carried with the spices and other riches of the tropics this famed capsule of sweetness. China learned to crystallize the sugar juice and the Arabians also developed the process. It is supposed to have been the famed Arabian physician-chemists of the seventh century who first separated it in the purest form and they included it in many of their medicines.

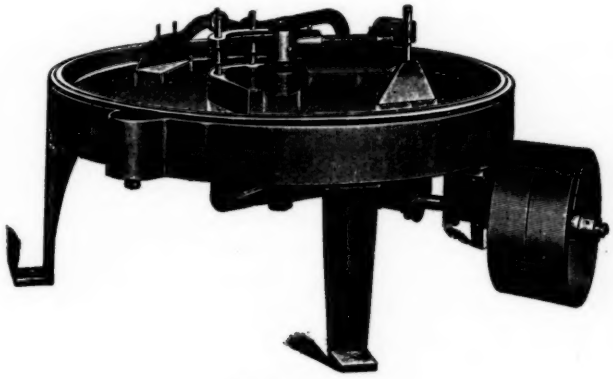
"It is said that Columbus on his second voyage across the Atlantic carried sugar plants to San Domingo and it was Peter, the Hermit, who inspired the Crusades of the Middle Ages, and who was thus indirectly responsible for the introduction of sugar into England when the Knights returned with the treasures found in the southland.

"The origin of the word sugar is believed to be a Sanskrit word Sarkara, corrupted by the Persians to the word shukar. It is also to the Persians to whom the word kand is credited, meaning with them a hard refined sugar, and this is doubtless the origin of the word 'candy.'

"Today sugar comes from other sources than the sugar cane, one being the sugar beet, which can be grown in temperate climates, but the largest quantities still come from the sugar cane, grown in tropical or semi-tropical lands, where it is extensively cultivated.

"If it were not for this basic sweetness a bon-bon could not be made but there is much more here than sugar. Its soft and creamy consistence has resulted from an ingenious process devised by the candymaker. He makes a thick syrup of the sugar by adding pure water, a little cream of tartar, and perhaps some corn syrup, which is a kind of sugar made from starch, and then he cooks the mixture until it is very hot, much hotter than boiling water, and has thickened to a degree which many trials has shown to be just right. Corn syrup and cream of tartar keep this mixture from crystallizing, for

that is one of the characteristics of sugar. Through some mysterious law a thick sugar syrup tends to separate in beautiful geometric forms commonly called *rock-candy,* or, in smaller crystalline form, the well-known 'granulated sugar.' These additions, however, have changed the character of the sugar and are said to 'invert it,' producing a mass which does not crystallize. Now, it must be beaten and worked, and kneaded until it becomes a thick rich cream, known as a *fondant.* From this mixture the bulk of the bon-bon is moulded, but it would not be fully acceptable if there was not an added flavor. Perhaps another voyage is needed and we must go to tropical Mex-



**CREAM BEATER**

ico, or to one of the islands of the South Seas, such as Tahiti, or to the Bourbon Islands, where beautiful orchids bloom, and later developed into fruits from eight to twelve inches in length, and somewhat resembling a banana but which, when dried and seasoned constitute *vanilla beans.* No more popular flavor is used than vanilla, the odor and flavor please children and grown-ups alike.

"You will notice that there are not many of these bon-bons in a box for most people prefer 'chocolates.' They add color, and flavor, and the variety which helps to make this package the gem it is. This happens to be a vanilla bon-bon and as I break it open some one has buried within a delicious *walnut goodie.*

"To make these bon-bons varied, good things from many other parts of the world are gathered. Here is one with *maple flavor.* How it carries us back to a crisp, winter morning in New England; a tramp through the snow brings us to the maple grove where the thin, trickling sap has been running from a hundred trees. There are

delicious odors, especially when it is carried back to the camp and we boil it down in huge kettles until it crystallizes into maple sugar. Here it lends its delightful and delicate flavor to this bit of candy.

"This white one suggests only a lump of sugar, but I find it soft enough to break. White, curling shreds fill the center, making a *white cocoanut bon-bon.* Cocoanut is one of the choicest gifts of nature.

"We now go far from New England's forests. It is the coast of Africa, fanned by the warm breezes of the Pacific. The tall, slender trees with graceful branches at the top constitute a cocoanut grove. The huge nuts in their mass of foliage are hard to reach but the nimble natives or perhaps some taunted monkeys throw them to the ground. I suppose you have seen the *commercial cocoanut*—the brown, oval nut which is so plentiful today in the fruit market. This well-known form is not the nut as it grows upon the tree. It is only the kernel, for the natural fruit is covered by a hard, waterproof shell which often floats upon the sea for hundreds of miles and is therefore distributed over the tropical islands throughout the world. Beneath this hard shell is a brown, fibrous mass which finds a use in door-mats and brushes. The inside of this shelled cocoanut furnishes a delicious, meaty food, much prized by the native and enjoyed in all civilized lands. When it is freshly opened, and grated, and immediately made a part of this bon-bon it is particularly gratifying and those who know the difference always insist upon using the freshly opened cocoanut meat.

"For variety, the bon-bon also has many other choice flavors. In the centers may be found a *pecan* or an *almond.* Perhaps the flavor of the *orange,* or *lemon,* or even such fruit as the *plum* or *apricot* may be hidden there.

"The soft center of the bon-bon needs some protection or it will soon become hard and unedible. Most bon-bons are seen to have a coat of snowy, sparkling whiteness. When these good things in the center have all been blended, the sphere of sweetness is placed in crystallizing syrup and left there long enough for a coat of crystallized sugar to serve as a mantle and protection.

"Here is a bon-bon which has been further *decorated with a choice pecan goodie.* Sometimes a candied violet or a bit of color may be used. Variety in decoration is unlimited.

"These candies remind me of another variety which every one likes. I see no samples in this box but the so-called *'chocolate straws,'* when crisp and fresh, are a most acceptable form of sweet.

These are not made like the candies so far described but call for as much skill by the candymaker. A mixture of sugar with a little cream of tartar and water, is cooked until it forms a soft, creamy mass. This may be flavored with chocolate, or vanilla, or with other flavors. A coating is now made by cooking a sugar mixture until it becomes brittle on cooling. This coating material is now poured out on a marble slab, the soft mass placed in the center, and the cooled, harder coating pulled over the soft center. This is now rolled into cylinders and the end pulled and spun into a long continuous straw which carries in the center the soft chocolate cream. When cut into suitable lengths it forms the chocolate straws.

"This small part of this wonderful box has already carried us into many mysterious places; already the possibilities from so varied a package are being realized.

"But is there time for another trip and a longer trip? Probably the choicest pieces here are these rich, brown, masses of delectable goodness, their odor alone is alluring—who does not love chocolate? Tradition credits chocolate with being a special gift of the gods. It not only has a delicious flavor when properly treated, but it is a most nutritious food. To go with chocolate back through its travels, is fascinating and interesting.

"This finished box of confections little resembles the *beans* taken from the cucumber-like chocolate or cacao pod, which is filled with a pulp, carrying a half hundred seeds. These pods grow in a most remarkable manner from a small tree. They sometimes spring from the trunk or again from a branch, apparently without any system or order. The tree being tropical and coming from Central America or the islands of the tropics, where it is carefully cultivated, is found to have the full-grown fruit, the pod in all its stages of development, and even the gorgeous flowers on the tree at the same time. The pods must be cut from the tree, broken open, and the beans separated from the pulp and placed in warm, sheltered sheds to ferment. When the process has reached the exact point, recognized only by the expert, they must be quickly dried. But these beans are not yet ready to furnish our delicious chocolates. They must yet pass through an elaborate treatment in well-equipped manufacturing plants, where the greatest care and skill is needed to produce the chocolate as we know it.

"The chocolate beans, coming from many parts of the world, have each a distinctive flavor. Skill in planting and curing gives variety and distinction to the commercial chocolates and the roasting,

as in coffee, is an essential process for the development of the aroma and flavor. One who is experienced must conduct the roasting, using an exact amount of heat, or the beans are spoiled. How do you suppose he knows when to take them from the oven; by the odor, of course.

"An ingenious machine now separates the thin shell and then the center is ground between huge stones, over and over again, until every particle of grit is removed. Here a very remarkable change occurs. The hard, brown bean enters the mill but from it trickles a stream of thick chocolate liquor. In this bean is about fifty per cent. of fat, commonly known as cocoa butter and this is liquefied by the heat of the friction in the mill. If this chocolate liquor is to be used for sweet chocolates, sugar must be added, also vanilla, and to incorporate these, another machine rubs and rubs, back and forth for hours, until the product is so smooth that it feels like velvet to the tongue.

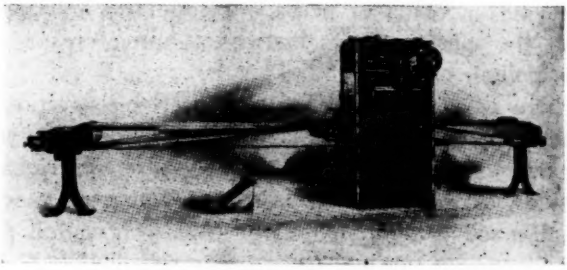
"To develop the finest flavor, the chocolate liquor must stand in a warm room for a number of hours, and then, while still warm, it is poured into moulds and cooled, forming the delicious sweet chocolate sold in a thousand forms and frequently mixed with almonds or other nuts.

"But this other piece is not all chocolate. As I break it open I find that the *chocolate* forms but a shell *around a creamy center.* This chocolate coating is also unusually rich. The ordinary sweet chocolate would not satisfactorily form a coating. It becomes necessary to place some of the ground chocolate beans in a huge machine where many tons of pressure is applied and then the *cocoa butter* separates from the more solid constituents. This cocoa butter, which is of a rich yellow color and has the delicious odor of chocolate, must be added in quite large proportions to the natural chocolate liquor to make a coated chocolate. The residue which remains in the press, when ground and powdered, forms a commercial powdered cocoa from which most of the 'hot chocolate' beverages are made.

"The center of this chocolate cream is not unlike the bon-bons already described, although the centers to a chocolate-covered confection may be of many other varieties. The mixture of sugar, cream of tartar, and corn syrup, with the added flavors, are first thoroughly cooked, then cooled on a marble slab and kneaded until creamy, and are then moulded in depressions made in starch. When these are cooled and firm, they are ready for coating. In the larger factories, moulding of centers for chocolate creams is done by a machine

called a 'mogul,' which exactly simulates the work done on a smaller scale by hand.

"A shallow wooden tray is filled with clean, fine starch, and smoothed off on the surface. Into it is then pressed a series of moulds made from plaster of Paris, these having the shape and size desired for the centers. The moulds fastened to a board are pressed into the starch and leave corresponding depressions, into which the cream of 'fondant' is run. In the mogul all of this is done automatically and with great speed and accuracy. When the centers have hardened the starch is removed by the use of a sieve and may again be used, while the centers are sifted and brushed and are then ready for coating.



**CHOCOLATE-COATING MACHINE**

"The coating with chocolate was originally done entirely by hand and the finest chocolates are still made in this way. Usually four operators sit at a table, about a kettle of coating chocolate, kept warm in a water bath. Each operator works on a slab of marble upon which the hot chocolate is spread and worked with the hand until of a proper consistence. Experience alone guides the operator in determining the proper conditions for coating. The chocolate is just right when it will not form too thin a coating or one which is too heavy. The center is rolled in it and deftly placed on a waxed paper on a tray. A skilled coater learns to 'pull' a string of chocolate over the top, giving it a characteristic curl which is considered an evidence of hand coating. No two pieces are exactly alike. To retain this effect the coating chocolate must be of the right consistence. Chocolate creams so coated must be kept for several days to allow the center to soften, or 'season' before they are at their best, but they should be stored at a low temperature, preferably in an ice-box, as heat will quickly injure their flavor. The cheaper chocolate creams are dipped

by machines but in even these an operator usually adds a string of chocolate, by hand, as they come from the machine.

"The center may carry any of the flavors, even mint, or the fruits or nuts already described, under bon-bons and it is quite customary to coat fruits themselves, in the same manner, especially Tokay grapes and sweet cherries. You may wonder how the liquid is gotten inside of candies called cordials when made with cherries or other fruits. This is explained by the fact that the fruit juices, after standing, dissolve the sugar and form a syrup which constitutes the cordial.

"A special center is called a *'nougat.'* This is a sugar center into which honey, eggs and chopped almonds have been incorporated. The mixture is cooked and kneaded to form a cream. Sometimes cocoanut is added to the center or perhaps some butter and cream. The latter forms the special centers known as 'butter creams' or Chantilly or Neapolitan creams.

"But here is a different chocolate-covered confection. Notice the little metal cup so ingeniously constructed. For many years these metal cups were made from pure tin and were often enamelled in various shades, as green, violet, wine-color, etc., but now they are practically all made of aluminum. Sweetened chocolate is placed into these until about half full and while still soft a jam, made from the finest fruit, perhaps *strawberry* or *raspberry,* is added to the center. It is then capped with sweet chocolate and a finish given from a special ridged spout so that distinctive designs are made for each piece.

"Among the oldest candies sold are those known as 'glacé' fruits. It is natural that an attempt would be made to conserve many fruits which in their fresh state are so much enjoyed. Sugar has long been known to be a preservative. Fruits which would quickly spoil are retained indefinitely when encased in sugar, which accounts for the fact that these have long been in the list of confections. Slices of *pineapple, fresh prunes, apricot fruit, grapes, cherries, dates,* and *figs* have thus been offered.

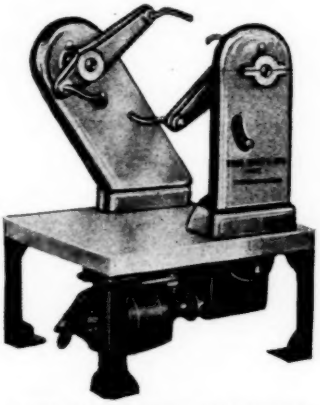
"In this marvelous box we find samples of the highest art of the confectioner of the twentieth century, an art painstakingly developed through the centuries but reaching its perfection within the last twenty-five years when luxury, wealth, travel and commerce have stimulated a more general appreciation of the more æsthetic and delightful sensations.

"It has not been many years since such a box as this would have been out of reach of the average person and even today many prefer

some of the older and time-honored candies which are more simple in their origin and preparation.

"Who has not enjoyed a taffy-pulling party? In many homes for many years, home-made *taffy* was the most common confection and it still finds a large place in the popular sale of candies.

"Instead of pulling candy by hand it is now, on the larger scale, at least, made by machines which most ingeniously pull and stretch the mixture of sugar, water and flavor. When this has been properly pulled it becomes white indicating the presence of tiny particles of air. It is often given some special name such as 'salt water taffy' and as such this erstwhile home product enjoys an enormous sale.



**CANDY "PULLING" MACHINE**

"A sort of glorified taffy has come into the modern market recently under the name of *pralines*. The South, especially New Orleans, is given the credit for their origin and they consist of a cake of maple flavored sugar to which has been added a large number of most delicious nuts mostly pecans. Plenty of butter adds to their deliciousness.

"When the best kind of taffy has had an exceptional large amount of butter added, it forms what is commonly known as '*butter scotch*' and every one doubtless knows how good a candy it makes.

"When peanuts are added to taffy, the product is known as '*peanut brittle*' and walnuts make the commercial '*walnut brittle.*'

"Among the candies of this class but yet quite distinctive, are the well-known caramels. These are made by combining eggs, rich cream and butter with sugar and glucose, and cooking to a stiff paste. Then flavor is added including, in many instances, chopped walnuts,

maple sugar or chocolate, to give variety. The finished mass is run on an oiled marble slab and cut into cubes and usually each one is wrapped in waxed paper. Caramels should remain soft—soft enough to chew.

"Here is a *marshmallow*. You know what memories they bring and how good they taste when toasted. Let's try this one and see if they are as good indoors as when toasted over the open fire of the summer camp.

"The marshmallow is one of the older forms of candy and for many years was made from a mixture of some gummy substances, originally that from the marshmallow root—hence the name. Later gum arabic, or acacia, was used mixed with sugar and the white of eggs, and the mass beaten until so full of air that it formed a soft spongy mass. This is poured into starch moulds, allowed to harden, freed from starch and finally packed in sugar. Modern marshmallows are mostly made from gelatin, corn syrup, sugar and corn starch, with some egg albumen to give them lightness and to hold the air.

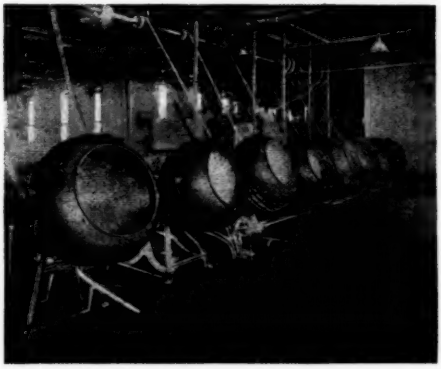
"Another of the older candies is known as *'gum drops.'* These were originally flavored mixtures of acacia, sugar and water moulded into small cones but in the modern gum drop corn syrup and starch largely replace the acacia. They should be soft enough to chew and are usually covered with crystallized sugar.

"I find another kind of candy. It is hard, and oval, and pinkish. Wait until I cut it open. The shell is brittle candy but inside is a nut. These are the justly famous Jordan almonds. They are made in a very remarkable way. When the almonds are selected, and blanched and dried, they are thrown into a large copper kettle which slowly turns round and round. A man pours in small quantities of syrup and warm air is blown over the rolling almonds until the syrup dries to form a coating. This process is repeated until a sugar jacket of the desired thickness covers every nut, and the last one carries the desired color, pink, yellow or green. This rubbing together and tumbling about makes them perfectly smooth and polished. By many these are considered to be the most delightful of confections. Their name is a corruption of a French word, Jardin, which means, 'garden' almonds, distinguishing them from the wild, bitter almonds which are not good to eat.

"This story of candy would not be complete without remembering that wonder candy of childhood, the peppermint and lemon sticks which bring so much joy to childish hearts. These belong to

the candies known as 'hard candies' and they are made by heating the syrup mixture to a very high temperature, many degrees beyond that of boiling water, until a consistence is reached which forms a clear, hard mass, on cooling.

"If this *hard candy* is to be made into 'drops' the flavor is added, lime, lemon, or orange oil, or perhaps horehound extract, the mass is then poured on a marble slab for a few minutes, and afterward forced through brass rollers, having depressions which make the *'drops.'* These are carried along on a moving belt to cool and finally sprinkled with sugar to keep them from sticking.



**COATING BASINS FOR JORDAN ALMONDS**

"If the mass is to be made into *'stick' candy,* it is usually pulled to make it white, especially if flavored with peppermint. A small portion of the main batch is taken out and colored red if they are to be peppermint sticks and this red portion is then divided into several parts and pressed into the mass of candy, so that it looks like red flannel patches. The mass is now rolled on a special table to increase its length and to form a gigantic peppermint stick. The red patches have thus become long red stripes the length of the stick and a twist gives it a barber-pole effect so characteristic of peppermint candy. This is now pulled or spun into sticks of varying thickness and cut of uniform length. If the end is turned while the stick is still warm behold the candy cane of the Christmas tree.

"If it is a lemon stick the main batch is not pulled but left to form a clear candy. Only enough is pulled to make white patches and subsequently white stripes, which are characteristic of lemon candy. Have you ever cut a hole in the end of a lemon, thrust in a

stick of lemon candy and drawn the juices through the candy like a straw. If not, try it; it was the supreme childish joy. Those peculiar gustatory glands start now at the suggestion of that sweet, sour, lemony flavor.

"One of the special delights of childhood so often found on the old-time Christmas tree was the so-called *'clear toy.'* This clear batch of cooked syrup sometimes colored red, was poured into tin moulds to make horses or men, ladders, drums or some other of the great variety of toys. These are still popular. Another candy of this character, heated to a very high temperature and made into drops or sticks, forming clear hard candy, is sold under the name of 'barley sugar.'

"It may be interesting to know that the original confectioner was the apothecary and that practically all candies of the Middle Ages were forms of medicine. These older forms are still found in the *mint* and *wintergreen lozenges* of the drug store, which are even now made by the old process in which a dough was formed from the sugar with the aid of acacia or tragacanth, flavored and rolled into sheets and then cut into various shapes with an appropriate punch.

"Another of the drug store confections which has not lost its popularity is the *stick licorice* which consists of an extract of licorice root usually carrying considerable filler to give it hardness, rolled into cylinders and with the name of the manufacturer pressed into one end flattening it. While this may not be classed as a confection in the truest sense, its distinctive and pleasant flavor is known to practically all children. The imitations made from gelatin, lampblack, and oil of anise sometimes found in cheap candies, poorly represent a true licorice flavor.

"But this is probably enough for tonight though the story is not half told. It is sufficient, however, to bring a realization of how our fortunate age is drawing upon the accumulated wisdom and experience of all the centuries.

"Civilization means a refinement of the appreciations and a demand for their gratifications. It is expressed in art by painting, sculpture and architecture, in music by magnificent operas and symphonies, in literature by poems and essays, and for the gratification of the less erudite senses, perfumes and confections have been perfected."

# TOO MUCH ALCOHOL?

**By Fred B. Kilmer, Ph. M.**

THE VOLSTEAD ACT met a resounding "kick back" in the drug store. It brought spirited sessions into our associations, and filled the pages of the drug journals to overflowing. "Regulations, decisions, permits"—are an ever-present burden. The "worm of the still" has become a living spectre in pharmacy.

Long before prohibition, all over the land, thousands of pharmacists had refused to dispense liquors for beverage purposes. The attempts made in the Volstead era to saddle the stigma of the sale of beverage liquors upon the pharmacist, has aroused indignation, and the bootlegging druggist wears the brand of Cain. Intoxicants in beverage form have no place within the modern drug store.

In the dawn of civilization man discovered the art of brewing intoxicating drinks. In all lands, among all races, will be found vodkas, pulques, wines, brandies, whiskies, rums, gins, cordials. The effect of these upon the race concerns the pharmacist only as a humanitarian and as a citizen.

Where and when alcohol entered the drug store is not easy to determine. The primitive form of drug administration was the chewing of the herb. Then came the "herb teas," which still live in our infusions.

The ancients had visions of a "quintessence" of drugs. Their idea was of a whole drug crushed, pressed and squeezed into a liquid form, carrying all the power of the whole drug. From this was evolved the "robs" and juices. Alkaloids came as a realization of the alchemist's dream.

Somewhere in the moving tide of civilization, man acquired the art of producing fermented liquids. (Wine from the grape is attributed to Noah.) The medicine man quickly learned to steep his drugs in wine, that he might extract their virtues. Medicated wines remain with us after untold centuries of use. With the art of distillation came alcohol. This the apothecary utilized to fortify his medicinal wines. The wise apostle of materia medica, Dioscorides, issued a cautionary note as to the accelerated pulse produced by alcoholized wines.

In the Middle Ages, or possibly prior thereto, the "Spirits of Wine" (aqua ardens), came into use for the extraction of drugs, and through the centuries alcohol remains the almost universal solvent for drug constituents.

Alcohol flows in and out of the drug store in the form of liquid extracts, tinctures, elixirs, cordials, wines, spirits, solutions and perfumes, in patent medicines, and in innumerable forms of liquid preparations.

In scanning our formularies one is prone to question whether the selection of the alcoholic menstruum is not in a large part traditional. For drug "A" an alcoholic menstruum of "B" percentage strength, for drug "C" an alcoholic menstruum of "D" percentage strength are, in the main, prescribed because a certain menstruum in a certain strength has long been used. From another point of view, our menstruum is selected by reason of its efficiency in producing, so far as possible, preparations that will remain clear and salable.

It is to be feared that under such influences the physiological action and therapeutic efficiency are not sufficiently considered. In using alcohol we may be selecting the wrong menstruum, or using it in too large proportion.

E. R. Squibb, long ago, and Remington, following him, extracted drugs with acetic acid; Beringer produced a line of extractions using glycerin as a menstruum. I recently had occasion to follow their work, and succeeded in producing very eligible preparations.

When we put a portion of a dried and ground vegetable drug into a percolator and pour alcohol upon the drug, the alcohol passes into the cells of the drug and flows out carrying such substances as are soluble in the alcohol. The alcoholic liquid is being loaded with what we call extractive, including presumably the therapeutically active constituents. If our percolator is of the narrow type and our drug layer is ten inches in height, as the percolation proceeds, the menstruum when it reaches the lower strata is loaded with drug constituents to a much greater degree than when it passed through the upper layers. As the alcohol moved through the drug from the top down, its solvent properties changed with every fraction of an inch.

As percolation goes on we reach a point which we call "exhaustion," in the sense that we believe we have removed such constituents as we desire. If we now add fresh portions of alcohol, we find that our alcohol, especially if varied in strength, still removes something from the drug, and that it is very difficult to arrive at a point where the percolate will not contain some sort of substance removed from the drug. We never seem to reach the end. An unsolved problem in percolation is to know when to stop.

In the older process of maceration we have a greater uniformity

in respect to menstruum. In the repercolation process, weak percolates become the menstruum. Here also there is a varying menstruum. If we use a continuous extraction method by connecting a reflex condenser, we vaporize the alcoholic menstruum from the percolate and carry the vapors to the condenser and thence back to the percolator. Redistilled alcohol becomes the menstruum.

Here new conditions arise. We have the effects of continued heat upon the percolate; as the alcohol passes into vapor the drug constituents remain behind, held in a continually changing hot solvent. The continued heat and changing menstruum certainly have a notable influence upon delicate drug constituents in the plant.

The vapor which rises from the percolate in a continuous action process is not purely alcoholic. With many vegetable drugs volatile compounds are either loosened or formed in the process, pass over with the alcohol and to a degree change the character of the menstruum. (This action is notable in the case of pungent drugs carrying highly volatile principles. With some of the alkaloid drugs volatile bases have been detected in the alcohol distillate.)

Lloyd had tersely stated that in a constant redistillation of alcohol from vegetable drug extraction, the alcohol "wears out." This means that its solvent power has changed, and fresh portions must be added.

If we take a portion of an alcoholic extract from a vegetable drug and subject it to heat in an apparatus where the vapor can be condensed, we find that the distillate varies from that of the first portion vaporized under low heat through fractions volatilized under more prolonged or higher heat.

Many of our tinctures, fluid extracts, elixirs, cordials and other alcoholic preparations of drugs are clear and transparent solutions when first prepared, but upon standing a sediment is deposited. This sedimentation may be rapid or it may continue slowly for a considerable time.

The sedimentation of alcoholic extractions of drugs has been the subject of some study. Observers have reported that in certain instances this sedimentation did not impair the physiological or therapeutic effects of the preparation. On the other hand, with certain preparations carrying alkaloidal and glucosidal bodies, these latter, to a degree, are broken up and deposited with the sediment. Fortunately, the sedimentation, in the course of time, reaches a point where it is negligible, when upon decantation there remains a fairly clear preparation.

Alcohol has been termed a "universal solvent." This statement needs qualification. The solvent power of alcohol covers a wide range of substances. In our vegetable drugs, however, there are many constituent substances that are not carried into solution by alcohol.

That solutions of organic substances in alcohol are subject to change is witnessed in the so-called "ageing" or ripening of wines, brandies and other forms of spirituous liquids. These changes are to some degree dependent upon the concentration of the alcoholic content, and the kind and quality of extractive matter. These changes are accompanied with the formation esters and higher alcohols. Our alcoholic extraction of drugs carries these same elements, hence change is to be expected in an alcoholic solution of drugs.

The effect of this "ageing" of alcoholic solutions of vegetable drugs has been studied to a limited extent only. The action of an old tincture or extract, physiologically or therapeutically, has been reported as at variance with that which has been freshly prepared.

In the living cell alcohol is oxidized to carbon dioxide and water, with acetic acid as an intermediate stage. The cells of the drug in a percolator are not "dead" cells; their energy is only dormant. Under the action of such an energetic substance as alcohol there must follow reactions of many kinds.

The formidable list of substances elaborated by plants may be roughly classified as: carbohydrates, starches, sugars, cellulose, gums, jellies, etc.

The derivatives of the carbohydrates are the fixed and volatile oils, including plant acids, resins, waxes, resinous glucosides. Linked between the carbohydrates and the proteins are the amides. In medicinal plants the alkaloids are nitrogenous bodies of prime importance. Proteins contain the elements of the amides with the addition of sulphur and phosphorus. Enzymes or ferment substances of great importance in the living plant play an active role during the drying and preservation of drugs. Included in this class are the vitamins, of which we have only a meagre knowledge.

Neither the chemist nor the biologist has as yet been able to penetrate into the mysteries of the protoplasmic cell. About all we know is that it is a very complex mixture. Chemical analysis has revealed as among the substances found in plant cells the following: water, pepsin, myosin, vitellin, plastin, xanthin, sarkin, amide products, peptones, lecithin, glycogen and sugars, calcium compounds, so-

dium, chlorine and potassium compounds, iron phosphate, ammonium compounds, fatty acids, resinous matter, coloring matter, glycerin and certain illusive substances classified as "undetermined matter." How many of these substances are the result of chemical manipulation during our analytical processes we do not know.

In our extraction of drugs by an alcoholic or other menstruum, which of these constituents do we bring away, and which do we leave behind? What new compounds do we create? With such of these substances as are extracted in our pharmaceutical manipulations, which are the result of reactions in our extraction process?

In plant tissues there are to be found elements, small in amounts, but apparently important in the metabolism of the living plant. Among these elements are iron, magnesium, sodium, chlorine, calcium, potassium and sulphur. In our drug assays we count them as "ash" but give them no further consideration. Some of these elements appear in our drug extractions, some of them are left in the marc. In the living plant these elements seem to act as catalysts, aiding in the chemical steps by which the plant structure is built up, without entering into the composition of the substances elaborated in plant metabolism. As to the office of these elements in our drug extractions we make no reckoning.

The use of alcohol and its compounds as medicinal agents is within the province of the physician and not the druggist. Medical opinion is quite discordant as to the use of alcoholic preparations in therapy. Straw votes taken in medical societies bring out a goodly number who class alcohol as among the most valuable agents used in medicine. A like number would regard alcohol and its compounds as useless, if not dangerous, in the treatment of the sick. Who shall decide when the doctors disagree? Not the pharmacist!

Quite within the scope of the pharmacist is a study of the reaction of alcohol upon the drug substances with which it is combined, and its pharmacological action upon the living economy.

If we remove two growing plants from the soil and place one plant with its roots in water and the other plant with its roots in full strength alcohol, we can crudely observe the effects of alcohol upon plant protoplasm. The plant rooted in water will live and grow; the plant submerged in alcohol will rapidly change. The alcohol will extract the water contained in the protoplasmic cell and take its place; the tissues will shrink, harden and blanch; metabolism will change and cease. The alcohol and the constituents of the plant cells will

enter into new compounds. The effect will be observable even in that portion of the plant not submerged in alcohol; the vapor of the alcohol will apparently act upon the chlorophyl compounds, and they will become colorless; the alcohol itself will undergo oxidation.

These and other observable effects depending upon the concentration of the alcohol, demonstrates the reaction of alcohol upon the living cell.

Alcohol placed upon the mucous membrane of the mouth is followed by a stinging, burning sensation. Water is extracted from the cells, protein is precipitated, the tissue is hardened, local anæsthesia is produced, the effect being proportioned to the concentration and the amount of alcohol applied.

Similar results follow the application of alcohol to the unbroken skin, when it produces redness and burning—rubefacient action. We are familiar with this action through its practical application in bathing the skin of the sick, and the use of alcohol in liniments and embrocations. Here it is also to be noted that alcohol enhances the rubefacient action of drugs.

The action of alcohol upon the animal tissues is such as to produce a hyperemia, a congestion of the capillaries, a setting up of inflammation; such action, of course, depending upon the concentration of the alcohol and the extent of its use.

The effect of alcohol upon living tissue has been strikingly demonstrated in pharmacological experiments by feeding concentrated alcohol into the empty stomach of animals. Here inflammatory changes are produced, followed by serious results, if continued.

Subcutaneous injections of alcohol, and more especially the intraneural injections, have been reported as resulting in histologic degeneration. (Sollmann.)

These pharmacological effects of alcohol on living tissue are corroborated in the condition known as "chronic alcoholism," where the continued presence of alcohol in the body sets up a series of irritant and degenerative phenomena in various organs with which it comes in contact.

These observations as to the physiological action of alcohol are inserted here simply to illustrate the point that in our alcoholic preparations of drugs, the alcohol has an action quite distinct from the action of the contained drug.

In the clinic it has been shown that in alcoholic solutions of drugs, the alcoholic content acts independently of the drug, and may

mask the drug action. While it is true that in an alcoholic solution a drug will be absorbed more rapidly, it is also true that in such a preparation as a tincture or a fluid extract, the first action is often that of the alcoholic content. Thus in animal experiments and in the clinic, immediately after the administration of an alcoholic preparation, we can observe that the heart beats faster and stronger, and the skin becomes flushed by dilatation of its blood-vessels. This stimulation-like action may occur prior to and when the true action of the drug is that of a depressant.

These lines are not recorded as an indictment of the use of alcohol either as a therapeutic agent or as a beverage. They are simply suggestive—that in the alcoholic preparations of drugs, pharmacy has not as yet attained perfection nor reached the end.

In medicine there is need for liquid preparations representing the entire drug structure. Solutions of the so-called alkaloidal or other fragments of drugs do not meet this need. To be convinced of this one has only to observe the effects of such substances as the alkaloid quinine in comparison with the action of cinchona bark. Quinine is one of the active principles, but not the whole of the active principles present in cinchona.

A notable instance of the inadequacy of our drug preparations is found in the history of the important drug—digitalis. We have made alcoholic tinctures and extracts of many kinds; we have extracted glucosidal and saponin bodies, digitoxins, digitalins, digitophyllin, digitsaponin, preparations confusing in variety and kind. After two centuries we swing back to the discovery of the "old woman of Shropshire," and prepare an infusion of digitalis from carefully prepared leaves.

The medical profession use our alcoholic preparations of drugs because we provide nothing to take their place. Through the years drugs of apparent therapeutic value come into use in medicine. In the course of time they are discarded and fall into disuse.

Are such drugs discarded through lack of virtue in the drug, or because pharmacy failed to offer a preparation which was representative of the drug?

When a new drug comes into view, pharmacy at once exhibits it in the form of an alcoholic tincture or extract, often without an adequate study of the drug and its constituents.

This review shows that the use of alcohol in pharmacy has been, and is now, in a large measure, traditional and empirical.

Our menstruum has now become a maelstrom. We are engulfed in a Volsteadean whirlpool. Pharmacy and its medicinal preparations are discredited because of alcohol!

Oh, for a pharmaceutical Moses who, with his rod, will touch the turbulent sea and lead us to dry land! We need to modify, remake and revolutionize our drug preparations, hoping to curtail the use of alcohol or, better still, to banish it altogether.

Such an outcome is not an idle fancy. In recent times flavors and perfumes are made without alcohol—why not nonalcohol drug essences?

Above and beyond this we seem to need a new study, or a restudy, of our drugs, their constituents and our methods of extraction.

There is need of young men, students in pharmacy and drugs, who are not chained down by traditions, men with vision, faith, courage and patience, men who will give their lives to the task of evolving new and better drug preparations!

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# ABSTRACTED AND REPRINTED ARTICLES

## THE FIFTH ESTATE*

**By Arthur D. Little**

### I

BENJAMIN FRANKLIN was not perhaps in all respects a paragon, but he was unquestionably a polygon—a plain figure with many sides and angles. There were not enough buttons on his black coat to tell of the multifarious aspects in which his complex personality was presented to the world. He was craftsman and tradesman; philosopher and publicist; diplomat, statesman, and patriot. And he was, withal, a very human being. What concerns us particularly on this occasion is the fact that he was at once philosopher and man of affairs. His remarkable career should refute forever the fallacy which, unfortunately, still is current, that the man of science is temperamentally unfitted for the practical business of life.

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At the time when Franklin was in England the British Parliament was assumed to be composed of representatives of three estates: the lords spiritual, the lords temporal, and the commons; but Edmund Burke, pointing to the Reporters' Gallery, said: "There sits a *Fourth Estate,* more important far than they all." No one at all familiar with the ubiquitous influence and all-pervading power of the press would today question the validity of Burke's appraisal. Even then, however, there was present in England, in the person of Benjamin Franklin, a prototype and exemplar of the membership of a *Fifth Estate,* an estate destined to plan an even greater part than its predecessors in the remaking of the world.

This Fifth Estate is composed of those having the simplicity to wonder, the ability to question, the power to generalize, the capacity to apply. It is, in short, the company of thinkers, workers, expounders and practitioners upon which the world is absolutely dependent for the preservation and advancement of that organized knowledge which we call Science. It is their seeing eye that discloses, as Carlyle said, "the inner harmony of things; what Nature meant." It is they who bring the power and the fruits of knowledge to the multitude who are content to go through life without thinking and without questioning, who accept fire and the hatching of an egg, the attraction of a feather by a bit of amber, and the stars in their courses, as a fish accepts the ocean.

The curious deterioration to which words are subject has left us with no term in good repute and common usage by which the members of the Fifth Estate may properly be characterized. Sophists are no longer distinguished for wisdom, they are now fallacious reasoners. Philosophers, who once claimed all knowledge for their province, are now content with speculative metaphysics. Scholars have become pupils. The absent-minded and myopic professor is a standardized property of the stage and screen. The expert, if not under a cloud, is at least standing in the shade. In Boston one hesitates to call a professional man a scientist—he may be a Presbyterian; and a "sage," as an anonymous writer has pointed out, "calls up in the average mind the picture of something gray and pedantic, if not green and aromatic." Let us, therefore, for a time at least, escape these derogations and identify ourselves as members of the Fifth Estate. Although the brotherhood of the Estate is open to all the world, its effective membership nowhere comprises more than an insignificant proportion of the population. Two hundred and fifty constitute the membership of the National Academy of Sciences. The latest edi-

tion of *American Men of Science* includes only about 9500 names. The number is expanded to 12,000 on the roll of the American Association for the Advancement of Science. Although gathered from all countries—and though chemistry is one of the most active and inclusive sciences—the chemical papers, books and patents reviewed in *Chemical Abstracts* in 1923 were the product of about 22,000 workers. One may hazard the estimate that there are not in all the world 100,000 persons whose creative effort is responsible for the advancement of science.

The studies of Cattell indicate that in America, at least, the great majority of men of science come from the so-called middle and upper classes, or precisely those sections of society which, in Russia, have been practically exterminated in the name of the new Social Justice. In about two-thirds of Cattell's reported cases both parents were American-born, while the fathers of nearly one-half were professional men. Seventy-five per cent. depend upon the universities for support; from which we may assume that the burden of the higher surtaxes does not bear heavily upon the Fifth Estate.

In proportion to population the cities have produced twice as many scientific men as the country, but how many hearts "once pregnant with celestial fire" repose in country churchyards because of lack of opportunity and absence of the stimulus of contact cannot, of course, be known, nor can we tell how many brains, competent and well equipped to penetrate the mysteries of nautre, the war has cost the world.

Initiative is one of the rarest mental qualities, yet without it progress is impossible. Its combination with the scientific imagination and command of fact is still rarer and more precious. Since comparatively few of those who study science develop the capacity to extend its borders, the cost of a man competent to advance science has been estimated at $500,000 and his value to the community set at a far greater figure. Full membership in the Fifth Estate thus seems to involve the highest initiation-fee on record. It is a figure disconcerting to the candidate, but as Wiggam has finely said: "Only genius can create science, but the humblest man can be taught its spirit. He can learn to face truth."

That the Fifth Estate is not better appreciated or always understood by the world at large is not surprising. In their endeavors to secure accuracy of definition and expression its members have evolved a preposterous and terrifying language of their own. It is not ideally

adapted to the interchange of confidences in ordinary human intercourse. It does not lend itself to poetry. "Ladybird, ladybird, fly away home" becomes impossible when one is forced to address the prettily spotted beetle as *Coccinella dipunctata.* A primrose by the river's brim is much more than a yellow primrose to the botanist; it is a specimen of *Primula vulgaris.* The organic chemist produces a new synthetic product in a mass of pilular dimensions and bestows upon it a name that would slow up Arcturus. Nothing but static interference can account for the terms of radiotelephony.

If knowledge is to be humanized it must first be translated.

Dewar has said that the chief object of the training of a chemist is to produce an attitude of mind. It should be the object of all education to produce the scientific attitude toward truth. We may even agree with Robinson that "of all human ambitions an open mind, eagerly expectant of new discoveries and ready to remould conviction in the light of added knowledge and dispelled ignorance and misapprehensions, is the noblest, the rarest, and the most difficult to achieve."

Carlyle says, "The degree of vision that dwells in a man is a correct measure of the man." And President Coolidge has been quoted as saying in a recent interview:

"Everything flows from the application of trained intelligence, and invested capital is the result of brains. . . . The man of trained intelligence is a public asset. . . . We go forward only through the trained intelligence of individuals, but we, not the individuals, are the beneficiaries of that trained intelligence. In the very nature of things we cannot all have the training, but we can all have the benefits."

Now vision, a trained intelligence, and an open mind are the qualities which characterize all those who are worthy of membership in the Fifth Estate. They are qualities which the many-sided Franklin possessed in exceptionally high degree.

## II

Among all the activities with which his busy life was crowded Franklin undoubtedly found his greatest pleasure in the pursuit of science, and in that pursuit he followed the eclectic method. At a time when nearly everything awaited explanation his focused attention ranged like a searchlight over many fields. He observed the movement of winds and developed a theory of storms. He consid-

ered ventilation and the causes of smoky chimneys and proceeded to invent new stoves. He introduced the Gulf Stream to Falmouth skippers and demonstrated the calming effect of oil on turbulent seas to officers of the British Navy at Portsmouth. From earthquakes he turned to the heat-absorption of colored cloths and the fertilizing properties of gypsum. He wrote on sun spots and meteors; waterspouts, tides, and sound. The kite, which for centuries had been the toy of boys, became in Franklin's hands a scientific instrument, the means to a great discovery. That its significance is, even now, not universally appreciated is shown by the recent answer of a schoolboy, "Lightning differs from electricity because you don't have to pay for lightning." To Franklin, as the child of every man knows, we owe our initial conceptions of positive and negative electricity, and he was the first to suggest that the aurora is an electrical phenomenon.

The gregariousness, which is a prominent characteristic of the Fifth Estate, found early expression in Franklin. He formed the Junta, a club for the discussion of morals, politics, and natural philosophy, and in 1743 drew up a proposal for the organization of the American Philosophical Society, of which later he became president. He established a wide acquaintance and cemented many firm friendships among the foremost scientific men of France and England, by whom he was received on equal terms. In 1753 he was awarded the Copley medal of the Royal Society for his discoveries in electricity and, on his leaving England, David Hume wrote: "I am sorry that you intend soon to leave our hemisphere. America has sent us many good things—gold, silver, sugar, tobacco, indigo—but you are the first philosopher and, indeed, the first great man of letters for whom we are beholden to her."

The professional spirit which animates the Fifth Estate is essentially one of service. Its compelling urge in the search for truth springs from the conviction that the truth shall make men free. That spirit finds complete expression in Franklin's statement, "I have no private interest in the reception of my inventions by the world, having never made, nor proposed to make, the least profit by any of them." This impersonal relation to the children of his brain was indeed carried by him to an extent which ordinary human nature would find hard to emulate. "I have," he writes, "never entered into any controversy in support of my philosophical opinions; I leave them to take their chance in the world. If they are right, truth and experience will support them; if wrong, they ought to be refuted and rejected."

There is, nevertheless, a place for militancy in science. The world needs a Huxley for every Bryan.

Franklin was a man of science, but his career proclaims that it is possible to be a man of science and much more besides. Science was made for life, and life is more than science. Art in its fullest expression may touch deeper springs, human relations and affections may bring richer rewards, and public affairs may make a more imperious claim. With Franklin as their prototype the members of the Fifth Estate may well strive to emulate his devotion to the public service and his constructive interest in human affairs.

Error and misconception have a feline tenacity of hold upon life, and the Fifth Estate, though richly endowed with latent executive capacity, is still, in popular opinion, regarded as equipped for thought rather than for action. The practical man, busily engaged in repeating the errors of his forefathers, has little time and less consideration for the distracting theories and disconcerting facts of the man of science. Yet who, among the men of action, is more intensely and truly practical than Carty, Baekeland, Reese, or Whitaker? Where shall one find a firmer grasp on the details of business than that possessed by E. W. Rice, Jr., Gerard Swope, or Dr. Nichols? What quality caused the young director of a research laboratory to find himself responsible for the production of gas masks to protect four million fighting men? In a time of dire emergency it was a professor of chemistry who organized the great Edgewood Arsenal and developed the means and methods and the trained personnel required to supply munitions for a new type of warfare. It was not to a statesman or a business man or a great manufacturer that the Allies entrusted the supreme command. It was to a teacher in a French military school. The range and value of their public service obscures the fact that Charles W. Eliot was a professor of chemistry and that Hoover is an engineer. The League of Nations is a child of a schoolmaster.

Numerically the Fifth Estate has always been feeble and insignificant. Its total membership at any time could be housed comfortably in a third-rate city. No politician makes a promise or invents a phrase to attract its scattered and ineffective vote. Rarely do its members sit in Congress; when they do they sit in the gallery.

With less political influence than the sparse population of Nevada, the Fifth Estate has recast civilization through its study and application of "the great and fundamental facts of Nature and the

laws of her operation." It has opened out the heavens to depths beyond imagination, weighed remote suns, and analyzed them by light which left them before the dawn of history. It has moved the earth from the centre of the universe to its proper place within the cosmos. It has extended the horizon of the mind until its sweep includes the 30,000 suns within the wisp of smoke in the constellation Hercules and the electrons in their orbits within the atom. It has read the sermons in the rocks, revealed man's place in nature, disclosed the stupendous complexity of simple things, and hinted at the underlying unity of all.

Because of this new breadth of vision, this lifting of the corner of the veil, this new insight into the hidden meaning of the things about him, the mind of man, cramped for ages by taboos and bound by superstition, is emerging into freedom: into a new world, rich in promise, and of surpassing interest and wonder.

Man brought nothing into the world and through long and painful ages he added little to that nothing: a club, an axe of stone, a pebble in a sling, some skins of beasts, a rubbing of sticks for a fire. He might labor, but to what avail? Even today the South American Indian works incessantly, yet his labor produces little more than heaps of stones. To those who would have us believe that all wealth is produced by labor the Fifth Estate replies, "Wealth is the product of brains, and labor is productive only as it is guided by intelligence."

Science is the great emancipator of Labor. Bagehot has somewhere said, perhaps in *Physics and Politics,* that during the early stages of civilization slavery was essential to progress because only through the enforced labor of the many could the few have leisure to think. Today, in the United States, the supply of available energy is equivalent to sixty manpower for every man, woman and child. There is now leisure for all to think, but the millions prefer the movies.

It is not Labor, but the trained intelligence of the Fifth Estate which has endowed man with his present control of stupendous forces. It has solved problems that for ages have hindered and beset mankind. It has revealed great stores of raw materials, synthesized scores of thousands of new compounds, furnished the fundamental data which find embodiment in machines and processes and in those agencies of transportation and communication that have made of the world a neighborhood. It has enabled men effectively to combat disease, added years to the average life, and made it better worth the living.

## III

Benjamin Franklin died in 1790—one hundred and thirty-four years ago. Could he return to make appraisal, what wonders would confront his astonished vision, what triumphs of the Fifth Estate compel his admiration!

Electricity, which to his contemporaries was little more than an obscure force, the curious manifestations of which might supply an evening's entertainment, has become the structural basis of the universe. The atom of Democritus is now a microcosm, vibrant with energy that glows in the white light of the electric lamps, which have replaced the tallow dip. In place of the electrophorus and the charges of the Leyden jar he would find in our own country alone twenty-seven million horsepower driving generators in thousands of stations from which electric energy is distributed to our homes and factories and transportation lines to perform innumerable services. Imagine, if you can, the stunning impact of the impressions that would crowd the day of his return. With what amazement would he converse over a wire from Philadelphia to San Francisco or hear a voice transmitted through the ether from a point halfway around the world. So commonplace a thing as a street car would leave him open-mouthed with wonder, which might well increase at sight of an electric locomotive, hauling its hundreds of tons of freight.

In great industrial plants he would find electricity driving machines of an intricacy, precision, and productive power beyond the imagination of his generation, or at work in decomposing cells, and in the heart of glowing furnaces fashioning new products. In university and corporation laboratories would be revealed to him the marvels of the X-rays, photography, the fascinating world of the microscope, balances weighing 1-100,000th of a milligramme, the spectroscope, and all those instruments of precision and research which are the tools of the Fifth Estate. Elements unknown to him would be placed in his hand; fascinating experiments performed to demonstrate properties and relationships beyond his dream. The air, which he studied with reference to winds, combustion, and ventilation, would be reduced before him to a liquid as obvious as water, though boiling on a cake of ice.

Where once the postboy and the post chaise were familiar he would find our roads crowded with automotive vehicles and the country gridironed by the railways. Did he wish to send a letter across the continent, he would have only to commit it to the air mail to en-

sure its arrival in thirty-six hours. Were he called upon to revisit England, there would be no ten weeks' voyage in a sailing packet, but the speed and luxury of a 50,000-ton liner, oil-fired and turbine-driven. At Portsmouth, where he calmed the waves with oil, he would find, instead of wooden frigates and smooth-bore cannon, submarines and armored superdreadnoughts, a single gun of which could sink the entire British Navy as he knew it. Did he wish to proceed to Paris? He would have only to take passage in an airplane.

The gardeners Franklin knew grew peas for pleasure or profit. Mendel grew them and established the laws of heredity. Farming, which was a wholly empirical occupation, is now the special concern of a great governmental department devoted to the development of scientific agriculture. Here Franklin would learn of soil anlaysis and seed selection, of hardier and more prolific varieties of plants, of better breeds of animals, of methods of control of such virulent diseases as splenic fever, anthrax, hog cholera, and bovine tuberculosis. He would find his own experiments with gypsum extended to cover the whole field of chemical fertilizers, the air itself converted into an inexhaustible reservoir of plant food, and the efficiency of farm labor multiplied many times by ingenious agricultural machines.

He would find household economics revolutionized: the town pump replaced by running water; electricity a servant in the house; the food supply broadened and stabilized; domestic drudgery assumed by laundry, bakery, and factory; tasteful clothing within the reach of all; transportation and amusement for the multitude, and the history of yesterday sold for a penny; innumerable new industries, based on the findings of the laboratory, now offering means of decent livelihood to millions, opening careers to thousands.

In great hospitals, permeated with the scientific spirit and equipped with many new and strange devices for the alleviation of human suffering, he would hear of the incalculable benefits which medical and surgical science have conferred upon mankind. He would see the portraits and listen to the story of Pasteur and Lister and Loeb and Ehrlich. We know today with what joy and relief the world would welcome a veritable cure for cancer, but we can little realize the emotion with which one like Franklin would learn in a single afternoon of the germ theory of disease, of preventive serums, of antisepsis, of chemotherapy, of the marvelous complexity of the blood stream and the extraordinary influence and potency of the secretions of the ductless glands. What appraisal would he make of the service to humanity which, in little more than a generation, has

mitigated the horrors of surgery by the blessings of anæsthesia and antisepsis, which has controlled rabies, yellow fever, typhoid fever, tetanus, which is stamping out tuberculosis, curing leprosy, and providing specifics for other scourges of the race? What values would he put on insulin, thyroxin, adrenalin? The physician is no longer compelled to rely on herbs and simples and drastic mineral compounds of doubtful value and uncertain action. Compounds of extraordinary potency, isolated or synthesized by the chemist, are now available to allay pain, correct disorders, prolong life, and even to restore mentality and character.

With contributions to their credit which have so enriched and stimulated the intellectual life; which have brought the peoples of the earth together into closer touch than English shires once were; which have revolutionized industry, enlarged the opportunity of the average man, and added so greatly to his comfort and well-being, we may reasonably inquire, "What are the recompenses of the Fifth Estate?"

On the material side they have almost invariably been curiously inadequate and meagre. It is incomparably more profitable to draw the Gumps for a comic supplement than to write the *Origin of Species*. There is more money in chewing-gum than in relativity. Lobsters and limousines are acquired far more rapidly by the skillful thrower of custard pies in a moving-picture studio than by the no less skillful demonstrator of the projection of electrons. The gate receipts of an international prize-fight would support a university faculty for a year.

One may recall that Lavoisier was guillotined by a republic that "had no need of chemists"; that Priestley was driven from his sacked and devastated home; that Leblanc, after giving the world cheap alkali, died in a French poorhouse; that Langley was crushed by ridicule and chagrin in his last days. A month before the war who could have believed that within a few years the Fifth Estate in Russia would be utterly destroyed and in Germany and Austria existing at the very edge of starvation? What has happened there may happen again elsewhere if the intelligence of the world does not assume and hold its proper place in the direction of national and world affairs.

In the preface of his recent *Lehrbuch der Photochemie* Professor Plotnikow has written: "Home and property were pillaged by bands of idle Russians who used my library for cigarette papers. Hunger, misery, want, and personal insecurity, often approaching fear for my life, were the constant accompaniment of my labors."

One is reminded that Carlyle, on the authority of Richter, says: "In the island of Sumatra there is a kind of 'Light-chafers,' large fireflies, which people stick upon spits, and illuminate the ways with at night. Persons of condition can thus travel with a pleasant radiance, which they much admire. Great honor to the fireflies, But—!"

It is not becoming that the world expect the light to shine indefinitely when carrying a lantern is often less remunerative than carrying a hod. The money and the years of study required for special training are not recognized as invested capital, and the return from a decade of research is often taxed as the income of a year. Professorial salaries move forward as slowly as a glacier, but they seldom leave a terminal moraine. Yet teaching is our most important business; for a failure to pass on for a single generation the painfully accumulated knowledge of the race would return the world to barbarism.

Though material wealth is rarely acquired by the Fifth Estate, they have the riches of the royal man, defined by Emerson as "he who knows what sweets and virtues are in the ground, the waters, the plants, the heavens, and how to come at these enchantments." Their wealth is in the Kingdom of the Mind. It is inalienable and tax-exempt. It may be shared and yet retained.

A recent survey by a national magazine would seem to indicate that the majority of men have drifted into their vocations with little effort of selection and that a very large proportion ultimately regret their choice. This is seldom true of members of the Fifth Estate. Theirs is a true vocation, a calling and election. It brings intellectual satisfactions more precious than fine gold. They live in a world where common things assume a beauty and a meaning veiled from other eyes; a world where revelation follows skillful questioning and where wonder grows with knowledge. Together they share the interests, the communion of spirit, the labors and the triumphs of the fraternity of Science. The Law of Diminishing Returns exerts a control from which there is no escape in agriculture, industry and business. Research alone is beyond the twelve-mile limit of its inhibitions.

If the heavens declare the glory of God that glory is surely made more manifest by telescope and spectroscope. If the whirling nebulæ and the stars in their courses reveal Omnipotence, so do the electrons in their orbits reveal His presence in universes brought into being by the striking of a match. The laboratory may be a temple as truly as the church. The laws of Nature are the Will of God.

their discovery is a revelation as valid as that of Sinai, and by their observance only can man hope to come into harmony with the universe and with himself.

There has been a general and ready acceptance by the world of the material benefits of science, while its contributions to sociology and ethics are as generally ignored as guides to human conduct. Yet science proclaims new commandments as inflexible as those engraved on stone, and furnishes what Wiggam has reverently termed "the true technology of the Will of God."

Science has so drawn the world together and so rapidly remoulded civilization that the social structure is now strained at many points. Statecraft and politics, law and custom, lack the plasticity of science and are now in imperfect contact with the contours of their new environment. The result, as events have shown, is friction and confusion. Though our civilization is based on science, the scientific method has little place in the making of our laws. Office does not seek the man in the laboratory, and candidates are not pictured as engaged in any activity that might suggest a superior intelligence. They are shown milking cows, pitching hay in new blue overalls, or helping with the family washing. Recently, in the senate of a New England state, there was presented the edifying spectacle of the presiding officer, being shaved by a barber, called to the rostrum, while senators were reading the encyclopædia into the record. To expedite further the public business sundry members of the chamber were presently gassed with bromine. Does not this suggest that a few chemists might with advantage be distributed among our legislative bodies?

It is claimed that fifty per cent. of the members of state legislatures in America have never been through high school and that only one in seven has been through college. We see in the ranks of science knowledge without power and in politics power without knowledge. An electorate, which regards itself as free, listens to the broadcast noise of manufactured demonstrations and is blind to the obvious mechanics of synthetic bedlam. The result is too often government by gullibility, propaganda, catchwords, and slogans, instead of government by law based on facts, principles, intelligence, and good will.

As President Stanley Hall once said, "Man has not yet demonstrated that he can remain permanently civilized." Many thoughtful people have been led to question the ultimate effect of science upon civilization. We all recognize the utility of matches, but we keep them away from children. Meanwhile, science puts dynamite and

TNT, poison gas, airplanes, and motor cars at the disposal of criminals and leaders of the mob. Bertrand Russell, in *Icarus,* sees in science the ultimate destroyer. Haldane, in *Dædalus,* visualizes it as the stern and vigorous chastener and corrector which will ultimately save the race and usher in the new day of light and reason.

"Knowledge comes, but wisdom lingers," and democracy levels down as well as up. Even in Boston cigars have replaced books on a corner famous for a century of literary associations. The world is wrong because few men can think. It will not be made right until those who cannot think trust those who can. When its foundations are so obviously out of joint humanity still clings tenaciously to fossilized precepts and opinions and is as resentful of suggested change as in the days of Galileo. Despite the pressure of new ideas, education must still, to be acceptable, follow old conventional lines.

## IV

Let us not deceive ourselves. Human life is still a hard and fearsome thing. Mankind is required to maintain existence in a world in which, as Kipling has said, "any horror is credible." More than a hundred years ago De Quincey wrote, "We can die, but which of us, knowing, as some of us do, what is human life, could, were he consciously called upon to do it, face, without shuddering, the hour of birth?" But little more than yesterday Henry Adams closed his *Education* with the expression of the hope that perhaps some day, for the first time since man began his education among the carnivores, he would find a world that sensitive and timid natures could regard without a shudder.

Everywhere there is upheaval and unrest. "The machine," to quote Dr. Elton Mayo, "runs to an accompaniment of human reverie, human pessimism, and sense of defeat."

We are everywhere overburdened by unnecessary illness, crushing taxation, extravagant and inefficient governments, huge expenditures for trivialities, and the appalling waste of effort, material, and resources. We are hampered by class suspicion and misunderstanding, racial antagonisms, the inhibitions of organized labor, and the lack of imagination in high places. Life in general is on a low cultural plane and bound by custom and tradition.

One hundred years of science have failed to satisfy the cravings of humanity. Chesterton finds science "a thing on the outskirts of human life—it has nothing to do with the centre of human life at

all." We do not, of course, agree with him, but we must still meet the challenge of John Jay Chapman, who declares: "Science, which filled the air with so large a bray, is really a branch of domestic convenience, a department for the study of traction, cookery, and wiring. The prophet-scientists have lived up to none of their prospectuses." The fault, however, as Wiggam points out, is not with science, nor with the scientists. It is with those who "have mainly used the immense spiritual enterprise of science to secure five-cent fares, high wages, and low freight rates," when it should have "ushered in a new humanism."

Thus we still encourage race deterioration, still carry the burden of the unfit, still cultivate national antipathies, still are breeding from poor stock, and witnessing with equanimity the suppression of the best.

The history of aristocracies, feudalism, the Church, the guilds, and the soviets has amply demonstrated that no one class possesses the qualities required for the government of all classes, and we cannot claim them for the Fifth Estate. We can, however, claim with full assurance that the Fifth Estate possesses many qualities, now practically ignored, which could be utilized in government to the incalculable advantage of us all. Its knowledge of material facts, of natural and economic laws, of the factors governing race development and human relations; its imagination, vision, and its open mind, should be brought to bear effectively in the formulation of national policies and the solution of governmental problems. There is an alternative before us, which has recently been defined with somewhat surprising frankness by Warren S. Stone, President of the Brotherhood of Locomotive Engineers, perhaps the most conservative of the labor unions. Mr. Stone says:

"But until labor, in the inclusive sense in which I am using it, secures control of legislative and executive branches of the national and state governments, and through control of the executive branch secures control of the judiciary, labor is in continuous peril of seeing its gains wiped out and its progress retarded by hostile legislation or unfriendly court decisions."

Our countrymen may well consider whether they prefer participation in government by the Fifth Estate to the benefit of all or control of government by labor unions in the interest of labor.

Since most of the troubles that beset mankind have their origin in human nature it would seem worth the while of those who make our laws to study and apply the findings of the biologists and psychol-

ogists as to what human nature really is and the springs of its motivation.

Plato called democracy "the best form of bad government." It will be the best form of good government only as it develops the capacity to breed leaders and the faith to trust them. The quality of our children will determine the quality of our democracy. If our laws and *mores* and economic structure continue to discourage breeding from our best strains, if there is to be no adequate recompense for service of the higher types, the time is not far distant when democracy will no longer be safe for the world. If the Fifth Estate were everywhere to be wiped out, as it has been in Russia, the result would be vastly more calamitous than universal war.

Oswald Spengler, in a recent monumental work, forecasts the downfall of Western civilization and would prove his thesis by the history of past cultures. But never in the past has man lived in so compact a world, never has he had such facilities for intercommunication with his fellows, never has he been endowed with such control of natural forces. He has never known himself so well and, above all, never before has he had it in his power to direct so definitely the course of his own development.

Our civilization is certainly imperiled, but there will be no downfall if mankind can be taught to follow the light already before it. As lantern-bearers, it is the clear duty of the Fifth Estate to show the way.

In the past the world has suffered grievously from lack of knowledge; today it suffers from its rejection or misapplication. Could the springs of human conduct and the affairs of peoples be regulated only as wisely as we now know how, there would be work and leisure and decent living for all. The criminal, the defective, the feeble-minded would be breeded out, and sane minds in sound bodies breeded in. The loss and suffering from preventable disease and accident would not be tolerated. Higher standards would govern the selection for the public service. Planning would replace *laissez-faire* development, and a rational conservation check the reckless waste of our resources. Production and distribution would attain to levels of efficiency altogether new, and the many injustices now existent in human relations would well-nigh disappear. With the reaction of a freed intelligence on politics, religion, morals, we might hope for a broader tolerance, a better mutual understanding. With the recognition of the spirituality of science and the divinity of research and discovery should come larger interests and a new breadth of vision to the average man, and

to us all acknowledgment of the steadfast purposive striving shown in the development of the created world, and a reverent appreciation of man's privilege to aid and further this development.

We might reasonably expect ugliness to be replaced by beauty in our cities and small towns and later even in our homes. Government by intelligence for the general good of all should supersede government by special interests, blocs, faddists, and fear of organized minorities and the uninformed crowd. With it all would come relief from the economic pressure which now bears so heavily upon the Fifth Estate that its children, who should be counted among the best assets of the community, are a luxury.

The world needs most a new tolerance, a new understanding, an appreciation of the knowledge now at hand. For these it can look nowhere with such confidence as to the members of the Fifth Estate. Let us, therefore, recognize the obligation we are under. Ours are the duty and privilege of bringing home to every man the wonders, the significance, and the underlying harmony of the world in which we live, to the end that all undertakings may be better ordered, all lives enriched, all spirits fortified.

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# SCIENTIFIC AND TECHNICAL ABSTRACTS

PERMITTED COAL-TAR FOOD DYES MUST MEET GOVERNMENT STANDARDS.—The particular process used in the making of coal-tar food dyes is immaterial, says the United States Department of Agriculture, provided the finished product complies with Government standards and requirements.

These standards are discussed in Department Bulletin No. 1390, Chemistry and Analysis of the Permitted Coal-Tar Food Dyes, just issued by the department. The bulletin also deals with the technical specifications, for each permitted coal-tar dye, the substance from which it is made, the usual method of manufacture, and gives the details of the methods of analysis used by the Bureau of Chemistry.

Copies of the bulletin, which is chiefly of interest to the users and manufacturers of permitted coal-tar food dyes, may be obtained, as long as the supply lasts, from the United States Department of Agriculture, Washington, D. C.

A New Process of Making Betaine Hydrochloride.—Recently, a novel process of manufacturing betaine hydrochloride and glutanic acid has been developed by a Multiple Industrial Fellowship of Mellon Institute of Industrial Research, University of Pittsburgh. The construction of a factory for the production of these substances is planned by the Fellowship donor. The proposed plant will produce five hundred thousand pounds of betaine hydrochloride annually.

Heretofore this hydrochloride has been available only at a very high price, and consequently the use of it has been limited. Unique properties make it especially desirable for crtain therapeutic purposes. Physiologically betaine is an inert, tasteless substance which has been proved to be without deleterious action on the human system. Betaine hydrochloride is a colorless, easily crystalline solid which, upon solution in water, liberates hydrochloric acid by hydrolysis. Thus it may be considered as a solid form of hydrochloric acid which may be taken in tablets without any harmful action on the teeth. For this purpose it has been sold under the pharmaceutical name "acidol."

Another important use of this acid is as a substitute for tartaric acid in the preparation of effervescent salts of all sorts. It is especially valuable in preparations in which tartaric acid is objectionable.

Betaine hydrochloride is also a potential source of trimethylamine and other methyl amines. A good yield of trimethylamine may be obtained from it simply by treatment with alkalies.

The investigations concerning the properties and uses of this interesting acid are being continued at Mellon Institute and doubtless will disclose other commercial applications of the substance.

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Bats as Insect Exterminators.—Attention has been called lately to this subject by a book by Dr. Charles A. R. Campbell, of San Antonio, Texas, entitled, "Bats, Mosquitoes and Dollars," and also a Bulletin of the United States Department of Agriculture (1395, March, 1926). Dr. Campbell is an enthusiastic advocate of the value of bats as mosquito exterminators and also as producers of guano. The latter phase is not important here, but the destruction of mosquitoes is a matter that interests everyone. Dr. Campbell claims that by the establishment of bat-roosts great numbers of ani-

mals may be congregated and the malarial mosquito practically exterminated. He has successfully established a large roost in his locality, but it appears from the investigations of the experts of the United States Department of Agriculture, summarized by E. W. Nelson, chief of the Bureau of Biological Survey, that such roosts have been successful only in this case. There are known about 260 species and subspecies of bats in North America, the particular one that seems to be most responsible in the reports for its mosquito-destroying power is the Mexican "free-tailed bat" (Tadarida mexicana), the range of which is in general restricted to the arid and semi-arid regions from Texas to California, extending into the warmer areas of Mexico. Bats are stated to be not at all prolific, usually bringing forth only one young per mother per year.

The subject of Dr. Campbell's book was discussed in this JOURNAL.

Obviously any effort to increase the number of bats will meet with serious objections due to the curious superstitions and fears concerning these animals. There is little doubt that their forms and night-flying habits are largely responsible for the dread of them. Most species of bats are either insect eaters or fruit eaters, but some of the tropical forms are blood-sucking, and there is always a liability for an animal of such a type to resort to blood-sucking when the usual food is scarce.

The United States Bulletin summarizes the investigation by the experts of the Bureau of Agriculture as follows:

North American bats destroy a large number of insects but have not been observed to exterminate any species. In estimating their powers in this respect it must be borne in mind that they are almost exclusively night-flying animals.

Attempts to colonize bats in large roosts have so far been successful in one case only.

Mosquitoes have been found in abundance in and about bat-caves and in the one case in which a large bat-roost has been established mosquitoes have not been appreciably diminished. The hope of extermination of these insect pests by means of bats seems entirely unfounded. H. L.

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TOXICITY OF LUPINE ALKALOIDS.—The genus *Lupinus* belongs to the family Leguminosæ of earlier days, but as Sganerelle says, "*nous avons changé tout cela*"—"this has all been changed" for the

family has been split into several groups and the familiar name is lost to sight though dear to the memory of the older students. As a rule members of the group are not poisonous and some of our most valuable sources of vegetable proteins are members of it. The seeds of some species of *Lupinus* are poisonous, due to the presence of alkaloids. The pharmacology of some of the more important species has been carefully studied by James F. Couch, whose interesting and valuable contributions are familiar to the readers of this JOURNAL. The investigation was extensive and the details are set forth in an article in the *J. Agric. Res.* (1926, *32*, 51). Great care was taken in identifying the plants and in separating the alkaloids; also in securing healthy animals (guinea pigs) for the purpose. Lupinin, d-lupanin, hydroxylupanin, spathulin and spartein were tried. The hydrochlorides were used except in the case of spathulin, the alkaloid itself being sufficiently soluble in water for the test. Tabulations of all data are given. The summary is as follows:

Authentic samples of the alkaloids were compared. The most toxic is d-lupanin. Spartein is slightly less, lupinin still less and spathulin fourth in order. Hydroxylupanin is about one-tenth as toxic as d-lupanin. For all the alkaloids except spartein the symptoms were essentially the same. Spartein produced tremors and spasms not regularly shown by the other four which are purely depressant and paralysant. H. L.

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THE ACOUSTICS OF AUDITORIUMS.—The increasing density of population in cities and the demand for entertainment has caused the construction of many theatres and lecture halls of large size and brought out new problems of heating, lighting, ventilation and auditory quality. These have been to a large extent solved, at least if the builders and owners of halls are willing to take advantage of the data now available. Electric lighting, under the development of the work of the illuminating engineer has been brought to a high degree of efficiency. Heating and ventilation have been also extensively studied and it is now possible to construct a hall of large capacity in which comfortable conditions may be maintained without difficulty. The auditory quality, however, is often overlooked. In a large part of modern entertainments this is, indeed, not so important, for the "silent drama" is now much in vogue, but music, lectures and the old-fashioned plays are common and for them satisfactory auditory qualities are needed.

Acoustic efficiency has received less attention, at least from the strictly scientific point of view. Halls are generally left entirely to architects, who have standards of artistic effect that do not meet practical requirements. The same is true of college buildings and laboratories. The question of the best method of constructing a large auditorium has been made the subject of an essay by Paul R. Heyl, Senior Physicist in the Sound Laboratory of the Bureau of Standards. The essay appears in Circular 300 of the Bureau.

Elaborate scientific investigation of the conditions under which speech can be satisfactorily heard in halls seems to date from an investigation by Professor W. C. Sabine, who in 1895 studied the subject in connection with difficulties that existed in the auditorium of the Fogg Art Museum at Harvard University, this hall having been found practically unusable. The principal difficulties in halls are: echo, reverberation, dead spots and sound foci. Echo is the definite repetition of the sound at an appreciable interval after utterance, and as everyone knows is annoying to both speaker and hearers. Reverberation is an indefinite repetition of the sound and is stated in the essay to be in moderate development advantageous. Dead spots are simply points at which the sound is seriously diminished and sound foci are points at which it is materially increased, often somewhat annoyingly.

In planning an auditorium three factors must be considered: shape, size and interior finish. The general design should avoid curved walls or domed ceilings. Introduction of features for artistic effect is almost certain to be detrimental to the acoustics of the room. (It is to be hoped that architects will give close attention to this point.) Auditoriums of rectangular shape have been the most satisfactory. Size is, of course, much dependent on the purpose for which the room is to be mainly used. A theatre is usually to be smaller than one intended for orchestral or choral performances. A liberal use of coffering (construction of deeply sunk panels) in the ceiling and sloping the upper walls are advantages. H. L.

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Uses and Handling of Liquid Chlorine.—This element in liquid form has become a commercial product of great importance and of varied use. It is employed for bleaching and of late years rather extensively for purification of water. The latter use has given rise to much complaint, though in many cases the taste of the water

is not due to the free element. The use as a war-gas was inaugurated by the Germans in April, 1915, at Ypres, at a point in the Allied line which was held by French and British troops, the latter largely Canadians. Though the Allied intelligence service was advised about two weeks previously that the Germans were establishing apparatus for gas attack, this was not believed and the attack when made was most disastrous. Very soon, however, gas masks were supplied and chlorine as such is not now available for war purposes, but largely used in the preparation of asphyxiating and irritating substances. The extensive use of liquid chlorine for bleaching and water purifying has rendered necessary strict regulations for its transportation, a matter which has received the careful attention of the Interstate Commerce Commission.

At the forty-ninth meeting of the American Electrochemical Society (Chicago, 1926, April 22-24) two papers relating to the use and transportation of chlorine were read. The relations of the element as a war gas were presented by Major General Fries, Chief of the Chemical War Service and the transportation of the liquefied substance was described by Messrs. Wells, Marey and Rowland, experts connected with establishments making the material. Chlorine is transported largely in steel cylinders but tank cars holding slightly less than 12,000 liters (421 cubic feet) are also used. The precautions of shipment and the construction of valves and other accessories are described in detail. Major General Fries gives an account of some of the important war gases now recognized as efficient, and states that this method of warfare is less inhuman than the older methods. Many gassed persons recover completely under proper treatment. H. L.

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# MEDICAL AND PHARMACEUTICAL NOTES

QUANTITY OF VANILLA BEANS TO BE USED IN STANDARD EXTRACT.—"Vanilla extract and nonalcoholic vanilla flavor should contain in each United States gallon the alcohol soluble matters from not less than 13.35 avoirdupois ounces of vanilla beans in order to conform to the standard adopted by the United States Department of Agriculture," say officials of the Bureau of Chemistry, who are charged with the enforcement of the Federal Food and Drugs Act.

"The Bureau of Chemistry has been informed," they say, "that some manufacturers employ only 12.8 ounces of beans per gallon of extract in the erroneous belief that this proportion of beans to extract conforms to the standard which is expressed in the metric system. This deviation below the standard while apparently slight, is of great importance in view of the large volume of vanilla extract used in flavoring food. To comply with the requirements of the law, not less than 13.35 ounces of beans per gallon should be used."

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A CENTENNIAL WINE.—In these days of centennials—mono-, sesqui-, bi- and poly-, it is of some interest to note the results of an analysis of a wine definitely 100 years old. The report comes from an Italian laboratory, the analysis having been made by Dr. G. Issoglio and published originally in an Italian pharmaceutical journal, but the data for this abstract are taken from *Jour. Pharm. Chim.*, ([8], 1926, *3*, 331). The dusty label bore the note "Nizza Grandis, 1825. The liquid was of yellowish tint and the inner surface of the flask was coated with a slight deposit. Apart from the color, the aroma and taste suggested Chablis. The principal data were as follows:

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|---|---|
| Alcohol by volume, | 13.63 |
| Total extract, | 31.48 |
| Glycerol, | 9.45 |
| Acidity as tartaric acid, | 6.90 |
| Ash, | 2.76 |

Small amounts of volatile acids and esters were noted. Although the total acidity is calculated as tartaric acid, a complete analysis showed but little of this, the principal forms being malic, lactic and succinic. The analyst explains the small amount of tartaric acid by the fact that much of it has been deposited as acid tartrate and the rest destroyed by micro-organisms. H. L.

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A CHEMICAL TEST FOR ALCOHOLIC INTOXICATION. H. W. Southgate. (*Medico-Legal Society*, Jan., 1926; *Lancet*, 1926, *210*, 207-209.)—Four years' investigation on human subjects has shown that the concentration of alcohol in the blood is proportional to the toxic effect produced, that there is a close relationship between the concentration of alcohol in the blood and in the urine, and that one can be deduced from the other. In the tests described the blood sam-

ples were taken from a vein, and the alcohol was determined by distillation and oxidation with dichromate and expressed as mgrms. per 100 grms. of blood. The concentration curve of blood and alcohol rose very rapidly (in about one hour) to its maximum, and slowly came down, taking about twelve hours to return to normal, which was probably zero. The rate of disappearance was practically a straight line, and this held good for a wide range of concentration and for all the persons tested. The glucose curve rose with equal rapidity, but fell within about one and one-half hours to the normal of about 80 mgrms. per 100 grms. The kidneys could keep back glucose until it reached quite a high percentage in the blood, but had not this power for alcohol, and even half a glass of beer caused alcohol excretion. The actual maximum concentration varied with the dose. When alcohol was taken with food the concentration rose more slowly and never reached such a high maximum as when the dose was taken on an empty stomach. Some of the alcohol was held between the interstices of the food, but not enough to account for the difference, and what became of it was not known. The descending curves of concentration with and without food were parallel when the subject took exercise, as well as when he rested. The tolerance of individuals varied very much according to their habits. For example, it was shown by Schweisheimer in 1913 that an abstainer showed a high concentration, and too heavy drinkers relatively low ones. Yet the factor of personal idiosyncrasy was very great, and it was impossible to be certain from the percentage in the urine how much alcohol had been taken. Gréhant was the first to show that the concentration of alcohol in the blood was the measure of its toxic effect. When the body's maximum was reached the curve turned over and ran flat for a while (Gréhant's plateau). The subject was then dead drunk, and the alcohol escaped by any pore it could find. There was no practical difference between the toxicity of a rising and a falling concentration measured on the same level. Comparison of the relative effects of whiskey and stout, containing the same amount of alcohol, showed that with whiskey the concentration reached a higher maximum much more quickly than with stout, had a greater effect on the subject, and passed off more quickly. This was because the stout took much longer to drink. Toxicity was measured by the subjects' ability to draw a square, with its diagonals, inside a circle.

Miles has shown that the concentration of alcohol in the urine passes that of the blood almost at once, and maintains a fairly con-

stant ratio towards it (1.35 to 1.45), whatever food is taken and whatever urine is passed. This point is important, as the evidential value of the test depends upon it. A motorist who was arrested for drunkenness had 257 mgrms. of alcohol per 100 grms. in his urine fifteen minutes after the arrest, but forty minutes later was released after being found sober by the police surgeon. A sample of urine taken some time after the arrest would naturally not show the same concentration as at the time of arrest. To find this, the test might be standardized, another sample of urine being taken at a measured time afterwards, and the concentration at the time of arrest plotted on the resulting curve, the time between arrest and the taking of the first sample being known. Any standard devised should be based on behavior tests made with individuals of varying tolerance, each of whom had a dose that would make his concentration the same as that of the others. This test would show what was the average concentration beyond which a person was not fit to be in charge of a car.—*Analyst.*

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## NEWS ITEMS AND PERSONAL NOTES

A School of Pharmacy for West China.—West China is composed of three provinces, having a population of over 100,000,000, and in this large area there is only one school of pharmacy, which is located at Chengtu. It is apparent that here is a vast opportunity for pharmacy. (1) In research—when we consider that many of our most widely used drugs are produced in this section. (2) In public health service—because of the general ignorance of hygiene, and the deplorable sanitary conditions. (3) In modern retail stores, which are being opened everywhere, and operated by incompetent persons; qualified native pharmacists should replace them as early as possible. (4) In the medical, nursing, and dental schools, and the fourteen mission hospitals and twenty dispensaries, as only two of these have qualified pharmacists.

Basing West China's needs on one graduate native pharmacist for every 2500 people, a total of 40,000 are needed. The West China School of Pharmacy has undertaken to supply this need. The West China Union University (an intermission school, jointly operated and controlled), is co-operating with the school of pharmacy by giving prerequisite courses. However, the school is hampered by lack of

sufficient staff, buildings and grounds, equipment and endowment. The following is a list of the needs of the school:

1. Staff.
   Two Western Trained Pharmacists.
2. Buildings and Grounds.
   (a) Pharmacy Class and Laboratory Building.
   (b) Dispensary and Sales Building.
   (c) Botanical Garden and its maintenance.
3. Laboratory Equipment.
   (a) Pharmacognosy Laboratory, sufficient equipment for fifty students.
   (b) Plant Analytical Laboratory Equipment.
   (c) Pharmacy Laboratory Equipment, sufficient for fifty students.
4. Library, an assortment of pharmaceutical and scientific books and periodicals.
5. Scholarships and Awards—to help worthy students. Ranging from $20 to $60 per year.
6. Endowment. One or more substantial endowments would make possible extensive pharmaceutical and medical research.

The variety of the needs offers a splendid opportunity for constructive philanthropy by both individuals and organizations.

Mr. E. N. Meuser, missionary pharmacist to West China, is, during this, his year of furlough, soliciting aid toward this school of pharmacy, and will be glad to receive communications from interested friends, addressed to 1421 Arch Street, Philadelphia, Pa.

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HAY FEVER PREVENTION.—Not far away, and coming steadily nearer, is the hay fever season. While the general public and the professional jokesmiths and cartoonists usually picture hay fever as a late-summer or fall affliction, nevertheless, the fact of the matter is that there are a great many individuals who are sensitive to the pollens of grasses and other plants of early spring. These unfortunate individuals suffer their symptoms early in the year and this doubtless explains why the term "rose fever" came into vogue.

Since pre-seasonal desensitization has proved to be the most effective method, it necessarily follows that these spring sufferers must begin treatment very early in the year.

Physicians are showing much interest in the new method of treatment that is being advocated this season—new in that a greater number of doses is being recommended, with larger protein content, and administered at shorter intervals than has heretofore been customary (12 to 48 hours). Such leading authorities as Dr. Scheppegrell, president of the American Hay Fever Prevention Association, report excellent results following the use of this intensified method of treatment.

Druggists are advised to keep abreast of the progress and changes in hay fever treatment, and to be posted with the latest information. This is a very profitable line of business and it pays to discuss the subject of hay fever with professional and lay customers alike.

Dove-tailing closely with the hay fever treatment is the question of diagnostic tests and desensitizing treatment for other forms of protein sensitization, such as various forms of foods, animal emanations, etc., and here again there is a chance for very profitable business in supplying the various tests and treatment.

Druggists may obtain literature on these important subjects for their own information, also for distribution to customers, by applying to H. K. Mulford Company, Mulford Building, Philadelphia, Pa., and mentioning this JOURNAL.

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DR. DUNNING AWARDED THE REMINGTON HONOR MEDAL.—The Remington Honor Medal was formally presented to Dr. H. A. B. Dunning, of Baltimore, at a dinner at the Hotel Pennsylvania, last Wednesday evening. The medal is bestowed annually by the New York Branch of the American Pharmaceutical Association to the pharmacist who has rendered the most outstanding service to American pharmacy.

Representatives of the American Pharmaceutical Association, American Chemical Society, National Research Council, American Drug Manufacturers' Association, National Association of Boards of Pharmacy, and the American Association of Colleges of Parmacy attended. Dean Charles H. LaWall represented the Philadelphia College of Pharmacy and Science.

The speech of presentation was by Dr. Jacob Diner, senior past president of the New York branch, and Dean of the Fordham College of Pharmacy. Dr. Dunning made a speech of acceptance. Clyde Eddy, president of the New York branch, presided.

Other speakers and their topics were: Dr. L. L. Walton, Williamsport, Pa., "Dunning and Pharmaceutical Organizations"; Dr. E. L. Newcomb, secretary of the National Association of Wholesale Druggists, and a former member of the faculty of the University of Minnesota, "Dunning and the American Pharmaceutical Association Building Fund"; Nathaniel Nicolai, New York, "Dunning the Man."

Dr. Dunning was eulogized as the directive force in the successful movement to raise $1,000,000 for a national headquarters building which shall serve as a national clearing house for all branches of pharmacy, and as one who has rendered notable service through research to the development of pharmaceutical science.

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# BOOK REVIEWS

THERAPEUTICS, MATERIA MEDICA AND PHARMACY. The Special Therapeutics of Diseases and Symptoms, the Physiological and Therapeutical Actions of Drugs, the Modern Materia Medica, Official and Practical Pharmacy, Prescription Writing, and Antidotal and Antagonistic Treatment of Poisoning. By Sam'l O. L. Potter, A. M., M. D., M. R. C. P., London. Fourteenth edition. Revised by R. J. E. Scott, M. A., B. C. L., M. D., New York. P. Blakiston's Son & Co., 1012 Walnut Street, Philadelphia.

The arrangement of this book is quite unusual. It consists chiefly of two distinct parts which differ so much in their purpose and value, that they might well have been made into two distinct books.

The first part is given up to the description of the sources, physical properties, physiological action, therapeutics, etc., of the pharmacopœial drugs, as well as many which are not recognized in that authority; no attention is paid to the National Formula. Most of the drugs recognized by the National Formula are described but are marked "unofficial." In view of the fact that the National Formula

is a legal standard, the use of such a term as "unofficial" seems unfortunate.

In this portion of the book the drugs are arranged in an alphabetical order; summary of their classification, according to therapeutic properties, is given in the introductory matter. This alphabetical arrangement has distinct advantages in a work which is used chiefly as a reference book, but lessens the value of the book as a general textbook.

The statements given concerning the properties of the drugs in part one, are brief but concise and explicit, and in the main consonant with present-day teachings.

Taken as a whole, the first part of the book is an admirable piece of work and valuably arranged for ready reference. There are few works of this character which contain so much information concerning the Materia Medica, condensed into so small a space, as it covers less than 500 pages.

The latter part of the book is much less commendable. It is mostly made up of a sort of glorified index of diseases. Under an alphabetical arrangement various diseases and symptoms are assigned paragraphs, in each one of which is given a list of the drugs which have been, some time or somewhere, suggested for the relief of these disorders, with one sentence giving a very sketchy suggestion of the way to apply them. After each drug is given an initial which refers to the author from whom the recommendation is copied; on referring to the key in which there are listed these authorities one is struck by the fact that of the more than forty quoted, there are less than ten who are still living, and many of them have been dead for twenty years and their books are long since out of print.

The art of therapeutics is a plastic one and there have been great changes in the medical practice during the past few decades. We are inclined to question the utility of such a method of treating the subject of therapeutics, at all, and are convinced that a discussion of the subject based upon authorities famous a generation or more ago, is of little value at the present time.

While of course the latter half of the book does not detract from the value of the first part, it does occupy shelf space to no advantage.

H. C. Wood.

PRAKTICUM DER PHYSIKALISCHEN CHEMIE. By Professor Leonor Michaelis, M. D., University of Berlin. 3d edition. viii—198 pages, small 8vo, paper bound. Illustrated. Berlin. Julius Springer. Mks. 7.50.

Physical chemistry has won full recognition in general chemistry only slowly, but its importance is now fully recognized. A half century ago manuals of chemistry generally contained a few chapters on what was called "chemical physics"; courses in chemistry at schools and colleges usually began with a short summary of the important facts concerning light, heat and electricity termed the physical forces, especially distinguished as operating at "sensible distances," contrasted with cohesion, adhesion and chemical affinity distinguish as forces acting "insensible distances." It may be said, indeed, that chemical affinity is still correctly so defined, for "contact" is the essential condition of chemical change. Modern industry and biochemistry have brought into great importance the substances known as "catalysts," which seem to act by bringing about intimate contact of other substances. The curious function that minute amounts of water may exercise has long been known. Of late years also very remarkable alteration of physical properties of substances have been noted in consequence of thorough and prolonged exposure to dehydrating agents.

Dr. Michaelis' book is presented in a third edition, within six years. The first two were prepared in Berlin, but the present issue is from Japan, the author being at present Professor of Biochemistry at the Nagoya University. The book deals largely with colloid chemistry, but also quite extensively with hydrogen-ion concentration. In about two hundred pages a comprehensive and clear account is given of the relations of colloid chemistry and ion concentration to physiologic and pathologic chemistry. The procedures are carefully described and in many cases illustrated by neat figures of apparatus. Printed in clear type on excellent paper and in convenient size, the work affords an excellent summary of the facts and principles to which it is devoted. H. L.